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AIRWORTHINESS AND QUALIFICATION TEST (PHASE D) CH-47B HELICOPTER

FINAL REPORT

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MARCH 1970

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US ARMY AVIATION SYSTEMS TEST ACTIVITY
EDWARDS AIR FORCE BASE, CALIFORNIA 93523

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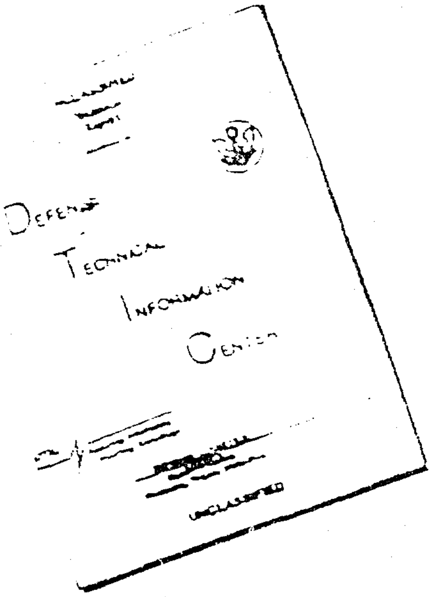

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(PHASE D)

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Abstract

The airworthiness and qualification tests (Phase D) of the CH-47B production helicopter were conducted at Edwards Air Force Base and Bishop, California, during the period 16 October 1967 to 9 July 1968. Performance, flying qualities and mission capability were evaluated to determine the suitability of the CH-47B as a replacement for the CH-47A, determine specification compliance and obtain detailed performance and stability and control information for inclusion in technical manuals and other publications. There were no deficiencies disclosed which would affect the mission accomplishment of the helicopter. There were four shortcomings in evidence for which correction is desirable. The shortcomings observed were: the lack of a never exceed airspeed computer in the cockpit, static longitudinal control instability at all airspeeds below 70 knots indicated airspeed (KIAS), unstable dynamic longitudinal control characteristics at all test conditions, excessive cockpit vibrations above 135 KIAS at light gross weights and also at 230 rotor rpm. The increase in gross weight from 33,000 pounds for the CH-47A to 40,000 pounds for the CH-47B and the resulting increase in payload capability are particularly noteworthy. The airspeed capability of the CH-47B is approximately 30 knots greater than the CH-47A; however, the vibration levels at airspeeds above 120 KIAS, light gross weights (below approximately 33,000 pounds) and 230 rotor rpm are excessive.

Foreword

The services of one aerodynamics engineer and one technical representative from the Vertol Division of The Boeing Company were used during the active test program. Fire fighting, medical aid, petroleum, oils and lubricants (POL), instrumentation calibration and photographic support for the project was provided by the US Air Force Flight Test Center (AFFTC) at Edwards Air Force Base, California.

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INTRODUCTION

BACKGROUND

1. A Chinook product improvement program was initiated to provide significant gains in performance and flying qualities of the CH-47 helicopter. The program (ref 1, app I) consisted of a two-step process. The aircraft configured for step one has been identified as configuration 1A and designated the CH-47B.

2. A test directive (ref 2, app I) issued by the US Army Test and Evaluation Command (USATECOM) provided for the US Army Aviation Test Activity (USAAVNTA) (redesignated the US Army Aviation Systems Test Activity (USAASTA)) participation in the product improvement program.

TEST OBJECTIVE

3. The objective of these tests was to obtain CH-47B production model detailed performance and stability and control information for use in determining specification compliance and inclusion in technical manuals and other publications on in-service aircraft. Sufficient testing was completed to evaluate the requirements of the following:

a. Conformance with the CH-47B detail specification for the model CH-47B helicopter (ref 3, app I).

b. Compliance with Military Specification MIL-H-8501A (ref 4).

DESCRIPTION

4. The CH-47B is a twin-turbine engine, tandem-rotor helicopter manufactured by the Vertol Division of The Boeing Company. It is designed to provide air transportation for cargo, troops and weapons within the combat zone during day, night, visual and instrument conditions. It is powered by two Lycoming T55-L-7C shaft turbine engines mounted in separate nacelles on the aft fuselage. The engines simultaneously drive two three-bladed rotors in tandem through a combining transmission, drive shafting and reduction transmissions. A turbine-engine auxiliary power unit hydraulically drives the aft transmission accessory gear box, which provides hydraulic

and electrical power for engine starting and other ground operations when the rotors are stopped. The fuel cells are contained in pods on each side of the fuselage. The helicopter is equipped with four nonretractable landing gear. An entrance door is located at the forward right side of the cabin fuselage section. At the rear of the cargo compartment is a hydraulically operated combination door and loading ramp. The pilot's seat and controls are located on the right side of the cockpit, and the copilots's seat and controls are located on the left. A detailed description of the test aircraft is presented in reference 5, appendix I. The following significant changes, as compared with the CH-47A, are incorporated:

a. Increased rotor blade area and airfoil camber (droop-snoot rotor blades).

b. Increased strength dynamic components including a vertical pin joint assembly, horizontal pin bearing, rotating swashplate, pitch links and forward and aft rotor shafts.

c. Blunted aft pylon.

d. Forward pylon bleed slot spoilers.

e. Fuselage afterbody strakes.

f. Relocated stability augmentation system (SAS) ports.

g. Reduced SAS authority and gain.

h. Lycoming T55-L-7C engines.

SCOPE OF TEST

5. The performance and flying qualities of the CH-47B helicopter were evaluated for service capability as a medium transport helicopter during day, night, visual and instrument conditions. The performance of the helicopter was evaluated against the performance guarantees of the detail specification (ref 3, app I), and the flying qualities were evaluated against the requirements of Military Specification MIL-H-8501A (ref 4). A summary of the detail specification performance guarantees and a comparison of the test results are included as appendix II.

6. A total of 137 flights were conducted during the test program totaling 169.7 hours with 105 flights and 138.7 hours of productive time. All flights conducted for verification of contractor

guarantees were flown with the HF antenna and the cargo mirror removed (as specified in the detail specification). The remainder of the flights were conducted with the HF antenna installed on the test helicopter. All flights were conducted with a 5-foot boom mounted on the nose of the helicopter, an extension and yaw vane indicator on the forward rotor mast and the DECCA dome installed. A drag correction was made for these items.

7. The normal operating limitations listed in reference 5, appendix I, were observed during all tests conducted except for the maximum gross weight. The maximum authorized takeoff and landing gross weight (grwt) was increased to 41,500 pounds to allow tests to be conducted at a 40,000-pound test grwt.

METHODS OF TEST

8. Flight test methods as outlined in the CH-47B flight test procedures document (ref 6, app I), and the Navy Handbook were used to acquire test data. The test techniques and data analysis methods are presented in appendix III. Specific methods used for conducting individual tests are presented in the Results and Discussion section of this report.

9. A detailed list of the test helicopter instrumentation is included as appendix IV. Calibrated engines were installed in the CH-47B for the tests. The fuel-flow method was used to determine the delivered power. Actual climb power required was based on extrapolated data of the engine's calibration curves.

CHRONOLOGY

10. The chronology of the test program is as follows:

Test directive received	June 1966
Aircraft received	8 July 1967
Flight tests started	16 October 1967
Interim report submitted	March 1968
Flight tests completed	9 July 1968
Draft report submitted	November 1969

RESULTS AND DISCUSSION

GENERAL

11. Flight tests were conducted on the production model CH-47B helicopter to obtain detailed performance and stability and control information for use in determining compliance with the detail specification and military specification (refs 3 and 4, app I) and to provide data for use in technical manuals and other publications. The CH-47B met or exceeded all contractor performance guarantees (see summary in appendix II). There were no deficiencies disclosed which would affect the mission accomplishment of the helicopter; however, there were four shortcomings in evidence for which correction is desirable. The shortcomings were: the lack of a never exceed airspeed (V_{NE}) computer installed in the cockpit, static longitudinal control instability at all airspeeds below 70 knots indicated airspeed (KIAS), unstable dynamic longitudinal control characteristics, excessive cockpit vibration. The increase in gross weight and payload capability of the CH-47B over that of the CH-47A was particularly noteworthy. The airspeed capability of the CH-47B is approximately 30 knots greater than the CH-47A; however, the cockpit vibration levels are excessive above 120 KIAS, light gross weights (below an approximate 33,000 pounds) and 230 rotor rpm. The overall flying qualities of the CH-47B are assigned a pilot rating of A3 according to the pilot rating scale (PRS).

PERFORMANCE

General

12. The fuel flow method was used for determining all power parameters. The data pertaining to all contractor performance guarantees summarized in appendix II were calculated in accordance with Specification 114-PJ-602, Vertol Division of The Boeing Company, *Detail Specification for the Model CH-47B Helicopter*, September 1966. All data in the performance guarantee summary are based on 100-percent best cruise speed. All other data in this report are based on 99-percent best cruise speed.

Hover

13. Hover performance data were acquired both in ground effect (IGE) and out of ground effect (OGE) using the tethered flight method. Rotor speed was varied from 215 to 235 rpm. Data were obtained

at approximate density altitudes of sea level (SL), 2300, 4100 and 9500 feet at hover heights of 5, 10, 20, 50 and 100 feet at each altitude. Hover height was measured from the right rear wheel to the ground.

14. The results of the hover performance test are presented in figures 1 through 14, appendix V. The hover performance summary (fig. 2) shows that the CH-47B exceeded the detail specification guarantee (to hover OGE at 6000 ft for 10 minutes at Mission I grwt on a 95°F day) by 1400 feet (23 percent). The results also show that the CH-47B exceeded the detail specification guarantee (to hover OGE on a standard day at SL and 38,000 pounds) by 2000 pounds (5.3 percent). Figure 1 shows that the useful load for the CH-47B hovering OGE on a 95°F day exceeds that of the CH-47A by 4700 pounds (32 percent) at SL and by 2000 pounds (16 percent) at a 4000-foot altitude. The large increase in useful load for the CH-47B at SL results from the CH-47A being gross weight limited and the CH-47B being limited by power available. At 4000 feet on a 95°F day, the gross weight of both the CH-47A and the CH-47B are limited by power available, and the 2000-pound increase in payload is more representative of the increase in operational capability. The excellent hover performance of the CH-47B helicopter enhances its operational capability.

Level Flight

15. Level-flight performance data were acquired using the constant referred rotor speed ($N/\sqrt{\theta}$) and referred gross weight (W/δ) method of test. Conditions included SL to a 15,000-foot density altitude (H_D); a 27,000- to 40,000-pound grwt; mid, forward and aft centers of gravity (cg's); and 225 and 230 rotor rpm. Test day data were corrected to level-flight conditions by standard energy corrections. The data were then generalized into the following parameters:

$\frac{W}{\delta}$ = Referred test gross weight (lb)

$\frac{SHP}{\delta\sqrt{\theta}}$ = Referred shaft horsepower (shp)

$\frac{V_T}{\sqrt{\theta}}$ = Referred true airspeed (Kts)

$\frac{N}{\sqrt{\theta}}$ = Referred rotor speed (rpm)

The resultant power required curves and the specification power available obtained from the manufacturer's data (presented in reference 7, appendix I) were used to determine performance characteristics.

16. The results of the level flight performance are presented in figures 15 through 57, appendix V. The referred level-flight performance data are presented in figures 39 through 50. Tests results show that the CH-47B exceeded the detail specification guarantee (cruise at 150 knots on a standard day at SL, normal rated power (NRP) and 33,000 pounds grwt) by 8.0 knots (5 percent) (fig. 15). At most level-flight test conditions, the maximum velocity of the helicopter was airframe limited; in that, V_{NE} could be exceeded within the power available and torque limits. A qualitative evaluation of the speed capability of the CH-47B indicated that the V_{NE} can easily be exceeded when operating at 225 rotor rpm before the airframe vibration levels become too uncomfortable; however, when operating at 230 rotor rpm, the V_{NE} would not normally be exceeded because the vibration level becomes uncomfortable before V_{NE} is reached (see para 60). The test helicopter was not equipped with a V_{NE} computer or a cruise guide indicator. It is recommended that one or the other be installed in the CH-47B helicopter. The computer should show the V_{NE} for both 225 and 230 rotor rpm.

17. Test results show the CH-47B exceeded the detail specification radius-of-action guarantee (100 nautical miles (NM) during Mission I) by 6.3 NM (6.3 percent) (see appendix VI for computation). The computation for the radius-of-action guarantee was based on the airspeed for 100-percent best range in accordance with the detail specification. All other range data presented in this report is based on highest airspeed for 99-percent maximum range. A radius-of-action summary plot is presented in figure 51, appendix V. Range summaries at SL, 5000 and 10,000 feet (at 225 and 230 rotor rpm) are presented in figures 51 through 57, appendix V.

18. Test results show the CH-47B exceeded the Mission I payload guarantee (6000 pounds outbound and 3000 pounds inbound for a 100 NM radius) by 1313 pounds outbound and 656 pounds inbound (22 percent). The increased payloads meet all guarantees for Mission I including the range, hover and single-engine service ceiling guarantees. The limiting factor for the increased payloads is the capability to hover OGE at 6000 feet on a 95°F day.

19. The rotor efficiency in level flight is presented in figures 58 through 69, appendix V. The data show that at the recommended climb speed range (70 to 80 knots true airspeed (KTAS)) the most

efficient rotor speed varies between 225 rpm at a 24,000-pound referred grwt and 227 rpm at a 40,000-pound referred grwt. At a cruise speed of 130 KTAS, the most efficient rotor speed varies from less than 225 rotor rpm at 25,000 pounds referred grwt to 225 rotor rpm at 40,000 pounds referred grwt. The results indicate that the most efficient rotor speed is affected by both gross weight and compressibility effects due to increasing advancing blade tip Mach number as forward airspeed increases. The increase in advancing blade tip Mach number as airspeed increases tends to reduce the rotor speed for most efficient operation. The level flight performance of the CH-47B helicopter is suitable for operational use.

Single-Engine Climb

20. The single-engine climb performance of the CH-47B helicopter was evaluated by two methods. The first method consisted of actual single-engine climbs, and the second method was by computation from level-flight performance test data as prescribed in reference 6, appendix I. The results of these evaluations are presented in figures 70 and 71, appendix V.

21. The single-engine service ceiling was determined from level-flight data by conducting power correction (K_p) flights to determine the variation of power with rate of climb, and level flights were conducted to determine the minimum power required. The K_p determined and the power available were used to compute the single-engine service ceiling. Using the level-flight method, computation shows the single-engine service ceiling of the CH-47B at Mission I grwt (29,924 lb) to be 7075 feet which exceeds the detail specification guarantee (6000 feet) by 1075 feet (18 percent).

22. The single-engine service ceiling of the CH-47B was also determined by actual single-engine climbs. The climbs were conducted at 27,000- to 30,000-pound grwt, 225 rotor rpm and military rated power (MRP). Corrections for rotor rpm variation, gross weight variation, acceleration, power available and air density were applied to test day data, and these data were then plotted to show the standard day variation in rate of climb (R/C) versus altitude. Test results based on the actual single-engine climb performance show the single-engine service ceiling at Mission I grwt to be 6750 feet (figure 70, appendix V) which exceeds the detail specification guarantee (6000 feet) by 750 feet (13 percent). The single-engine service ceiling of the CH-47B is suitable for operational use.

Dual-Engine Climb

23. The dual-engine climb performance was evaluated by conducting dual-engine climbs to the flight envelope limit altitude. Climbs were conducted at 27,000- to 40,000-pound grwt, 225 and 230 rotor rpm and normal rated power. The results of these tests are presented in figures 74 through 81, appendix V.

24. Test results show that at a 40,000-pound grwt and 9000 feet (flight envelope limit altitude), the R/C was 500 feet per minute (fpm) at normal rated power. At a 33,000-pound grwt and 15,000 feet (flight envelope limit altitude), the R/C was also approximately 500 fpm. There was no increase in vibration level as the flight envelope limit altitudes and airspeeds were approached, and there was no other indication that fore or aft rotor blade tip stall was being approached. The dual-engine climb performance of the CH-47B helicopter is suitable for operational use.

Takeoff

25. Takeoff performance testing was performed at a field elevation of 9500 feet, test gross weights from 32,090 to 38,000 pounds and a mid cg. Rotor speed was maintained at 230 indicated rpm for all takeoffs. A Fairchild flight analizer camera was used to record true ground speed and horizontal distance to clear both 50- and 100-foot barriers. The level-flight acceleration and constant airspeed climbout method was used. When sufficient power was available, all takeoffs were initiated from a 10-foot hover with topping power applied at initiation of takeoff. When sufficient power was not available to hover at 10 feet, takeoffs were initiated at the hover height obtained with topping power. For all takeoffs, a flight path approximately 5 feet above the ground was maintained during acceleration to approximately 5 knots below climbout airspeed, and then the helicopter was rotated to climb attitude. All data were recorded in less than 3-knot winds. To correlate the data, the excess power available was computed using zero delta power coefficient (ΔCp) as the capability to hover at a 10-foot height above the ground with maximum power available.

26. The results of the takeoff performance tests are presented in figures 86 through 97, appendix V. During the takeoff run, the helicopter could be rotated to climb attitude immediately after passing through translational lift and a climb would result; however, at the lower airspeeds and heavier gross weights, the helicopter would settle back toward the ground after reaching a 40- to 80-foot altitude. This was caused by insufficient power available to maintain level flight, OGE at takeoff conditions and climbout

airspeed. During all takeoffs where the helicopter reached a 100-foot altitude, a positive R/C was also maintained above 100 feet.

27. When insufficient power was available to hover at 10 feet above the surface, maximum pilot effort and technique were required to keep the helicopter from touching the surface during the acceleration run. When insufficient power was available to hover at 5 feet above the surface, it was almost impossible to keep the helicopter from touching the surface during the acceleration run. It is recommended that running takeoffs be executed when insufficient power is available to hover at a 10-foot aft wheel height.

28. Test results show that the takeoff distance required to clear a 50-foot barrier at zero delta power coefficient/thrust coefficient ($\Delta C_P/C_T$) from a 10-foot hover varied from a minimum of 830 feet at 30 KTAS to 1500 feet at 60 KTAS. At these takeoff conditions, a minimum of 30 KTAS was required to clear a 50-foot barrier; however, a minimum of 40 KTAS was required to maintain a positive R/C above 50 feet. A delta power coefficient thrust coefficient is a nondimensional measure of the difference between power available and power required at a given gross weight and hover condition.

29. Test results show that takeoff distance required to clear a 100-foot barrier at zero $\Delta C_P/C_T$ from a 10-foot hover varied from a minimum of 1320 feet at 40 KTAS to 1630 feet at 60 KTAS. At zero $\Delta C_P/C_T$ a minimum of 40 KTAS was required to clear a 100-foot barrier. At all heavier gross weights, a climbout airspeed of 60 KTAS resulted in a higher R/C after the barrier was cleared and felt more suitable to the pilot. The takeoff performance of the CH-47B helicopter is satisfactory for operational use.

Landing

30. No quantitative data were obtained on landing performance during the tests; however, the landing performance of the CH-47B helicopter was qualitatively evaluated throughout the test program. Test results indicate the landing performance in no way restricts the capability of the helicopter. Touchdowns with no forward roll could be accomplished at all conditions tested. At heavier gross weights and higher altitudes, a shallow approach (approximately 4 degrees) maintaining the minimum power required (approximately 70 KIAS) to an approximate 200-foot altitude and then decreasing airspeed and altitude simultaneously, proved to be the best method for ease of helicopter control and resulted in the best overall performance. Steeper approach angles resulted in an increase in power required for touchdown. The landing performance of the CH-47B helicopter is satisfactory for operational use.

STABILITY AND CONTROL

Control Force Characteristics

31. All control forces were measured on the ground with the auxiliary power unit (APU) supplying hydraulic pressure to the longitudinal, lateral, directional and thrust control systems. Forces were measured with a hand-held force gage, and control positions were recorded on the oscillograph. Control centering was ON during longitudinal, lateral and directional control force measurements. The thrust control rod brake switch was depressed during thrust control rod measurements. The results of the control rod force measurements are presented in figures 98 through 101, appendix V. A summary of the control force recorded and specification compliance is presented in table 1.

Table 1. Summary of Control Forces and Specification Compliance.

Control	Full Control Force Spec Limit (lb)	Full Control Force Test Result (lb)	Breakout Plus Friction Spec Limit (lb)	Breakout Plus Friction Test Result (lb)
Longitudinal	8.0	7.0	0.5 to 2.0	1.0 fwd 1.8 aft
Lateral	7.0	6.0	0.5 to 2.0	1.2 left 1.2 right
Directional	34.0	34.0	3.0 to 20.0	12.0 right 10.5 left
Collective	10.0	N/A	1.0 to 10.0	3 to 6.5

32. The longitudinal breakout plus friction force was 1 pound for a forward cyclic motion and 1.8 pounds for an aft cyclic motion. The force gradients for the first inch of travel from trim, both forward and aft, were at least equal to the breakout plus friction force. The forward and aft longitudinal stick force gradients were always positive (approximately 1 pound per inch of travel). The slope of the gradients for the first inch of travel was equal to the slope for the remainder of travel, and there were no objectionable discontinuities in the slope. A maximum control force of 7 pounds was required to move the longitudinal control either to the forward or aft stop from center trim. This movement on the ground is greater than the maximum ever encountered in flight. The longitudinal friction band varied from 1 to 1.5 pounds. The

longitudinal stick force characteristics met the requirements of the detail specification and are suitable for operational use (PRS A2).

33. The lateral breakout plus friction force was 1.15 pounds for both left and right directions. The lateral force gradients were approximately 1 pound per inch of stick travel and did not exhibit any objectional discontinuities. A maximum control force of 7 pounds was required to move the lateral control to either the left or right stop from center trim. This lateral movement on the ground was greater than the maximum ever encountered in flight. The lateral friction band varied from 1.2 to 2.4 pounds. The lateral stick force characteristics met the requirements of the detail specification and are suitable for operational use (PRS A3).

34. The directional breakout plus friction force was 10.5 pounds for left pedal inputs and 12.0 pounds for right pedal inputs. The directional control force gradients were approximately 5 pounds per inch of travel, and there were no objectional discontinuities. A maximum of 34.0 pounds was required to move the lateral control to either the right or left stop from center trim. This directional movement on the ground was greater than the maximum encountered in flight. The directional control friction band varied from 3.5 to 5.0 pounds. The directional control force characteristics met the requirements of the detail specification and are suitable for operational use (PRS A3).

35. The thrust control breakout plus friction force varied from 2.2 to 6.5 pounds for upward travel and was 3.0 pounds for downward travel above the 3-degree detent. The forces exhibited provided the pilot with a comfortable feel of the thrust control system. The thrust control system met the requirements of the detail specification and is satisfactory for operational use (PRS A3).

Controllability

36. The controllability was evaluated by introducing step inputs individually in all controls and recording the time histories of aircraft attitudes, rates and accelerations. A control jig was used to aid the pilot in precisely introducing control inputs. Controllability was evaluated for hover and level flight at varying gross weights, altitudes, rotor speeds and cg's. The results of the tests are presented in figures 102 through 116, appendix V.

37. The hover test results are summarized and compared to the requirements of MIL-H-8501A in table 2. The results show that the control power of the CH-47B about all three axes of control met

the requirements of MIL-H-8501A for both visual flight rule (VFR) and instrument flight rule (IFR) operation. Qualitatively, the longitudinal, lateral and directional controls were in good harmony and were sensitive enough to permit good pilot control of the helicopter. No controls were sensitive enough to cause the pilot to overcontrol the helicopter. The controllability about all axes was satisfactory during level flight. The controllability of the CH-47B is suitable for operational use (PRS A2).

Table 2. Control Power Compliance with MIL-H-8501A.

Control Axis	Input (in.)	VFR Specification Requirement Attitude Displacement (deg)	IFR Specification Requirement Attitude Displacement (deg)	Test Result (deg)
Longitudinal	1	1.3 at 1 sec	2.11 at 1 sec	3 to 7 at 1 sec
Longitudinal	Full	5.22 at 1 sec	20.9 at 1 sec	Satisfactory[1]
Lateral	1	0.78 at ½ sec	0.93 at ½ sec	2.5 to 4 at ½ sec
Lateral	Full	2.35 at ½ sec	2.78 at ½ sec	Satisfactory[1]
Directional	1	3.19 at 1 sec	3.19 at 1 sec	4 at 1 sec
Directional	Full	9.57 at 1 sec	9.57 at 1 sec	Satisfactory[1]

[1]These results were based on extrapolation; however, results indicate that all VFR and IFR requirements of MIL-H-8501A were met.

Sideward and Rearward Flight

38. Sideward and rearward flight tests were conducted to evaluate the hover capability of the CH-47B in crosswind and tailwind conditions. Data were recorded at the following conditions: a 26,000- to 36,500-pound grwt; a 2200- and 9500-foot H_D; forward, aft and mid cg's; and 230 rotor rpm. All data were recorded in less than 3-knot winds. A calibrated pace vehicle was used to determine airspeed. The test results are presented in figures 117 through 123, appendix V.

39. Test results show that sideward flight up to 35 KTAS could be reached using less than 40 percent of the available lateral control travel in either direction. As sideward flight speed increased,

the roll attitude increased in the direction of flight to approximately 18 KTAS then remained almost constant up to 35 KTAS. The lateral control stick gradient was positive and approximately linear for all test conditions (increasing right lateral control was required for increasing airspeed to the right and increasing left-lateral control was required for increasing airspeed to the left). The directional control (pedal position) and longitudinal stick position remained approximately constant throughout left and right sideward flight.

40. Test results show that the helicopter has positive static longitudinal stick position stability at airspeeds from 30 KTAS rearward flight to 30 KTAS forward flight. Approximately 3 inches of longitudinal control travel (23 percent) remained at 30 KTAS rearward flight at the most critical load condition (forward cg). This exceeds the requirements of the military specification (10-percent control remaining) by 13 percent. However, light droop-stop pounding in the rear was experienced when the helicopter was maneuvered around the 30-knot rearward point at forward cg loading. This indicates that the longitudinal control would be limited by droop-stop pounding rather than control travel. The pitch attitude of the helicopter generally became more nose down as airspeed was varied from 30 KTAS rearward to 30 KTAS forward flight. A small increase in right pedal was required as airspeed varied from 30 KTAS rearward to 30 KTAS forward flight.

41. The sideward and rearward flight characteristics of the helicopter met all requirements of MIL-H-8501A and are suitable for operational use (PRS A3).

Level-Flight Trim Curves

42. The level-flight data were plotted for various test conditions. The trim curves were plotted at different gross weights, altitudes, cg loadings and rotor speeds. The trim curves are presented in figures 124 through 135, appendix V.

43. The static longitudinal stability as evidenced by the longitudinal control motion in stabilized level flight shows that the helicopter is stable from approximately 70 to 160 KCAS and varies from almost neutral to unstable stability below 70 KCAS. Changes in cg, altitude and gross weight change the longitudinal stick position for a given condition but generally do not change the static longitudinal stability. The neutrally stable to unstable longitudinal control motion in level flight increases the pilot effort required for precise airspeed control below 70 KCAS, and correction is desirable for improved operational use (PRS A4).

Static Longitudinal Collective-Fixed Stability

44. The static longitudinal collective-fixed stability was evaluated in level flight, climb, partial power descent and autorotation at: 5000- and 10,000-foot density altitudes; forward, mid and aft cg's; 225 and 230 rotor rpm: 33,000 and 40,000 pounds grwt; and airspeeds throughout the flight envelope. Data were recorded with the helicopter trimmed in the desired stabilized flight condition and at stabilized airspeeds below and above trim airspeed while maintaining constant power and collective setting. The results of the collective-fixed static longitudinal stability tests are presented in figures 136 through 158, appendix V.

45. The static longitudinal collective-fixed stability of the helicopter was generally negative between airspeeds of 30 and 70 knots calibrated airspeed (KCAS) and positive at all airspeeds above 70 KCAS. The longitudinal stick position versus airspeed gradients are positive (forward longitudinal stick position required for increased airspeed and vise versa) but very shallow at airspeeds above 70 KCAS. The helicopter exhibited essentially the same stability characteristics at all test conditions. Increased gross weight or altitude moved the stick position forward but did not affect the stick position gradient. Moving the cg forward moved the longitudinal stick position to the rear and vise versa but did not affect stability. Rotor speed changes from 225 to 230 did not affect stick position or stability. At all test conditions, an approximate 1-inch forward movement of the longitudinal control stick was required to change the airspeed from 70 to 145 KCAS (maximum airspeed tested). At airspeeds below 70 KCAS, the longitudinal stick position gradient became increasingly unstable down to 25 KCAS (lowest airspeed tested). From 70 KCAS down to 25 KCAS, the longitudinal stick position generally moved more than 1.5 inches in the unstable direction. This unstable longitudinal stick position gradient exceeds the limits specified in paragraph 3.2.10 of MIL-H-8501A (0.5 inch in the unstable direction) by 1.0 inch; however, it does not exceed the limits specified in deviation 5 of the detail specification (2.25 inches in the unstable direction below a 50-knot airspeed). The unstable gradient in the airspeed range between 50 and 70 KCAS fails to meet the requirements of both MIL-H-8501A and the detail specification.

46. The CH-47 helicopter is presently used mainly on short-range missions (usually under 20 NM radius) with approximately 80 percent of the cargo being sling loaded. This causes the helicopter to be operated in the 60- to 80-knot airspeed range frequently. The negative to slightly positive longitudinal stick position gradient in this airspeed range increases the pilot effort required for

precise airspeed control and detracts from the mission capability of the helicopter. The collective-fixed static longitudinal stability of the helicopter failed to meet the requirements of MIL-H-8501A and deviation 5 of the detail specification, and correction is desirable for improved operational use (PRS A4).

Static Lateral-Directional Stability

47. Static lateral-directional stability information was obtained by recording data in steady-heading sideslips at the following conditions: a 2500- to 10,500-foot Hp; 57 to 122 KCAS; a 26,000-to 38,000-pound grwt; mid, forward and aft cg's in level flight, climbs and autorotations. The level-flight data were recorded in stabilized level flight and then at stabilized increments of increasing sideslip angles while maintaining constant power, airspeed and aircraft heading. The results of the static lateral-directional stability tests are presented in figures 159 through 175, appendix V.

48. The static directional stability of the CH-47B was positive in that left pedal was always required for right sideslips and vice versa for all sideslips throughout the flight envelope. The pedal position gradient was approximately linear up through 20-degree sideslip angles and then became slightly less positive for larger sideslips; however, the gradient never became negative. Directional stability was weak at slower airspeeds and became stronger as airspeed was increased. No significant difference in static directional stability resulted from varying altitude, gross weight, rotor speed or cg of the helicopter. More than 10 percent of the directional control effectiveness remained at all test conditions. It should be noted that the SAS increases the static directional stability by movement of the directional SAS actuators which is equivalent to increased pedal displacement in the direction of the sideslip as sideslip angles are increased. With the SAS inoperative, the static directional stability of the CH-47B would be greatly reduced.

49. The static directional stability of the helicopter met the requirements of deviation 6 of the detail specification and the requirements of MIL-H-8501A and is satisfactory for operational use (PRS A3).

50. As evidenced by the lateral cyclic stick gradient, the static lateral stability of the helicopter was positive at all sideslip angles. The lateral stick position gradient was approximately linear for all test conditions. The static lateral stability was weak at slow airspeeds and became stronger as airspeed was increased. No significant difference in static lateral stability resulted by

varying altitude, gross weight, rotor speed or cg of the helicopter. More than 10 percent of the lateral control effectiveness remained for all test conditions. The static lateral stability of the CH-47B met the requirements of deviation 6 of the detail specification and the requirements of MIL-H-8501A and is satisfactory for operational use (PRS A2).

Pedal-Fixed Turns and Adverse Yaw Characteristics

51. Pedal-fixed turns and adverse yaw characteristics were investigated in level flight at airspeeds from 50 to 120 KCAS by rolling into 30-degree bank angles in either direction at a rate of 5 degrees per second with pedals fixed. During bank entry to the left and right, a maximum of 10 degrees of adverse yaw (opposite to turn) developed; however, after the bank angle was established, the adverse yaw decreased to approximately 1 degree. As entry airspeed was increased, adverse yaw decreased. The adverse yaw was not objectionable as no reverse rolling occurred. Coordinated turns could be easily accomplished at all test conditions when both pedals and lateral cyclic stick control were used. The pedal-fixed turns and adverse yaw characteristics met all requirements of MIL-H-8501A and are satisfactory for operational use (PRS A3).

Dynamic Stability

52. The longitudinal, lateral and directional dynamic stability characteristics were investigated in level flight, climb, descent, autorotation and hover. Test conditions included: a 26,000- to 40,000-pound grwt; a 3000- to 10,000-foot altitude; mid, aft and forward cg's; 225 and 230 rotor rpm; and all airspeed ranges. Data were recorded and evaluated at all test conditions; however, only representative data are presented in this report. The test results are presented in figures 176 through 187, appendix V.

53. The short-period airframe and gust response characteristics were obtained by suddenly displacing the desired helicopter control 1 inch from trim for a duration of 0.5 second and returning the control to trim while recording time histories of the control positions, attitudes, rates and accelerations on an oscillograph. The short-period airframe characteristics were investigated about all three axes of control. The short-period response of the helicopter was similar for all test conditions and was well damped in all axes. The short-period response to longitudinal, lateral and directional pulse inputs was essentially damped in three-quarters of a cycle. The change in normal acceleration following the pulse inputs remained approximately zero. The short-period response characteristics met all requirements of MIL-H-8501A and are satisfactory for operational use (PRS A3).

54. The long-period airframe characteristics were obtained by exciting the long period of the aircraft and recording time histories of the resultant motion. The long period was originally excited by trimming the helicopter at the desired airspeed; and without changing power or trim, the airspeed was reduced 20 knots, and the stick was quickly returned to trim position using a jig. This method of exciting the long period caused the helicopter to go divergent in either ¼ or ½ cycle, and the long-period characteristics could not be fully evaluated. The long period was then excited by longitudinal pulse inputs, or it was allowed to become self-excited by maintaining a constant longitudinal stick position in level flight. When these methods of excitation were used, the airframe long period was generally oscillatory for 1 to 1½ cycles before reaching a limit condition and had a very long period of approximately 40 to 60 seconds. After the longitudinal motion of the helicopter was excited by any method, the time at which recovery was required varied from a minimum of 22 seconds up to approximately 2 minutes. The unstable long-period dynamic characteristics caused the pilot to continually make small control corrections in order to fly the helicopter precisely. The SAS certainly decreased the rate of instability and the amount of pilot attention required; however, it did not eliminate the longitudinal instability. The long-period dynamic characteristics met the requirements of MIL-H-8501A; however, improvement is desired for improved operational use (PRS A4).

Maneuvering Stability

55. The maneuvering stability characteristics were quantitatively evaluated by placing 1-inch rearward step inputs in the longitudinal controls and recording the resulting time histories of aircraft attitudes, rates and accelerations. These evaluations were completed at a hover and during forward flight to V_{NE} at various gross weights, cg's, rotor speeds and altitudes. The maneuvering stability characteristics were qualitatively evaluated throughout the flight test program. The quantitative results of the maneuvering stability tests are presented in figures 188 through 195, appendix V.

56. The time history plots of the normal acceleration and angular velocities of the helicopter always became concave downward within 2 seconds and remained concave downward until the attainment of maximum acceleration. The time histories also show the normal acceleration always increased with time until the maximum acceleration was obtained. Qualitatively, the maneuvering stability characteristics were satisfactory throughout the flight envelope of the helicopter. At heavier gross weights, higher density altitudes and maximum bank angles, increased pilot effort was re-

quired to control airspeed and altitude; however, the pilot effort required was not excessive. The maneuvering stability characteristics of the CH-47B helicopter met all requirements of MIL-H-8501A and are suitable for operational use (PRS A3).

MISCELLANEOUS

Weight and Balance

57. The computations used to determine Mission I grwt are presented in appendix VII. The empty weight was determined by weighing the aircraft. The required fuel for the mission was computed from level-flight performance data obtained during these tests. The computed Mission I grwt was 29,924 pounds, which is 74 pounds more than the estimated Mission I grwt as given in the detail specification.

Airspeed Calibration

58. Flight tests were conducted to determine the ship's system airspeed position error and to calibrate the boom airspeed system. Data were recorded in level flight, climb and autorotational descent during coordinated flight and in varying degrees of sideslip from level flight. The "ground speed course" and the "trailing bomb" methods were used to calibrate the boom airspeed system. The airspeed calibration data are presented in figures 196 through 204, appendix V.

59. Test results show the ship's system airspeed position error varies from a maximum of -9.5 knots at 30 KCAS to a minimum of zero at 140 KCAS in level flight. During maximum power climbs at 80 KCAS, the ship's system airspeed position error is approximately +8 knots; and during autorotation, the position error is approximately -10 knots. The airspeed position error caused by sideslips was always minus and varied to a maximum of 30 knots at [illegible] degree sideslip in either direction. The position error caused by sideslips between zero and 10 degrees caused an airspeed position error of only -2 knots. The CH-47 helicopter is primarily used for short-distance transportation of supplies, equipment and personnel. Numerous takeoffs and landings are conducted, and much of the flying time is in the airspeed range from 60 to 80 KCAS. The airspeed position error in the CH-47B is suitable for operational use; however, a reduction in the position error below 80 KCAS is desirable for improved operational use.

Vibration

60. Vibration data were recorded from vertical and lateral pick-

ups mounted at fuselage station (FS) 50, FS 95, FS 120, FS 320 and FS 480 in the test helicopter. Vibration data were recorded during selected performance and stability and control flights to obtain vibration levels at various gross weight, cg's, rotor speeds and altitudes throughout the flight envelope. The test results are not compared to the contractor's guaranteed vibration levels as water ballast tanks were mounted in the test helicopter throughout the test program and did not properly simulate a troop load as specified in the guarantee. The vibration levels obtained are considered to be representative for normal mission accomplishment. The test results are presented in figures 205 through 228, appendix V.

61. Table 3 summarizes the maximum vibration levels recorded. The data show that the higher vibration levels are mainly a function of airspeed and rotor speed. The vibration levels are higher at higher airspeeds and 230 rotor rpm. The highest vibration level recorded was 0.93g (three-per-revolution) at FS 50 (pilot's seat) at 160 KTAS, 230 rotor rpm, a 27,000-pound grwt and a 1300-foot Hp. The vibration level at similar conditions, except at 225 rotor rpm, was approximately 0.35g. The one-per-revolution vibration levels were acceptable throughout the flight envelope for all conditions. The three-per-revolution vibration levels were the greatest, and the six-per-revolution vibration levels were significantly high. The lateral vibration levels were much lower than the vertical vibration levels and were acceptable throughout the flight envelope. Qualitatively, the three-per-revolution vertical vibration levels in the cockpit (FS 50) were unacceptable above 130 KTAS at all conditions within the flight envelope. The pilot's handbook presently recommends that 225 rotor rpm be used for all flight conditions below a 37,000-pound grwt. Using 225 rotor rpm instead of 230 rotor rpm between a 33,000- and 37,000-pound grwt reduces the airspeed capability (flight envelope limit) of the CH-47B by approximately 10 knots. It should be noted that the cockpit vibration absorbers are tuned to 225 rpm, but the remainder of the vibration absorbers are tuned to 230 rpm. This contributes to the increased vibration level in the cockpit at 230 rpm. However, if the cockpit absorbers were tuned to 230 rpm, the vibration levels in the cockpit would be greater at 225 rpm. In summary, the presently recommended procedures restrict the airspeed of the CH-47B by approximately 10 knots below a 37,000-pound grwt; however, these procedures are considered necessary because of the otherwise unacceptable cockpit vibration levels. The excessive cockpit vibrations above 120 KIAS at light gross weights (below approximately 33,000 pounds) and 230 rotor rpm are shortcomings which should be corrected for improved operation and mission capability. It is recommended that consideration be given to retrofitting the CH-47B with self-tuning absorbers in the cockpit area to reduce the vibration levels and increase the mission capability (PRS A5).

Table 3. Vibration Summary.

Gross Weight (lb)	Density Altitude (ft)	Rotor Speed (rpm)	Center of Gravity	Airspeed (KCAS)	Maximum Vertical Vibration[1] (g)	Maximum Lateral Vibration[1] (g)
40,000	5,000	230	Mid	38 to 106	0.49(6/rev)	0.28(6/rev)
37,000	5,000	225	Mid	38 to 142	0.26(6/rev)	0.17(6/rev)
27,000	1,300	230	Mid	59 to 160	0.93(3/rev)	0.43(3/rev)
27,000	11,000	230	Mid	42 to 138	0.44(3/rev)	0.25(3/rev)
27,000	5,000	225	Aft	38 to 158	0.32(3/rev)	0.23(3/rev)
27,000	5,000	225	Fwd	62 to 148	0.34(3/rev)	0.20(3/rev)

[1]The vertical and lateral vibration levels are the maximum levels recorded at FS 50, FS 95, FS 120, FS 320 or FS 480.

Engine Characteristics

62. During the test program, temperature and pressure inlet surveys were conducted; airspeed, altitude, temperature and rpm effects on power output were determined; and the power available was compared to the specification engine's power available. Engine performance was satisfactory throughout the progrnm except one engine developed a surge problem when operated in the vicinity of 80 percent gas producer speed (N_1) at altitudes above 8000 feet. This engine was removed and sent to Lycoming for an analysis. The analysis indicated that the cause for the surge problem was due to manufacturing tolerances in the compressor section, and the problem would not exist in other engines. Engine performance checks at the begining and end of the program show there was no engine deterioration during the test program. The engine characteristics data are presented in figures 229 through 251, appendix V.

63. Engine temperature and pressure inlet data were recorded at incremental airspeeds during stabilized level flight. The data are presented in figures 229 and 230, appendix V. On the basis of measured data, zero inlet temperature rise at all airspeeds was assumed in the data reduction. There was generally a very slight increase in compressor inlet pressure at all airspeeds up to 70 KCAS, and the inlet pressure increased to 1.024 times ambient pressure at 144 KCAS.

64. The maximum power output of the test engines was recorded and compared to the Lycoming specification engine. The results show that test engine S/N LEO 3202 averaged approximately 25 shaft horsepower (shp) below the specification engine, and test engine S/N LEO 3204 averaged approximately 130 shp below the specification engine. The reduced power available from both test engines was attributed to the N_1 topping adjustment. Engine power output from the test engines is suitable for operational use.

CONCLUSIONS

GENERAL

65. The CH-47B helicopter exceeded all contractor performance guarantees (para 11).

66. The increases in gross weight and payload capability of the CH-47B helicopter in comparison with the CH-47A are particularly outstanding (paras 14 and 18).

67. The airspeed capability of the CH-47B is approximately 30 knots greater than the CH-47A; however, the vibration levels above 120 KIAS, light gross weights (below an approximate 33,000 pounds) and 230 rotor rpm are excessive (para 16).

68. Within the scope of these tests, the CH-47B met all requirements of MIL-H-8501A except the cockpit vibration levels and the static longitudinal stability requirements (paras 45 and 54).

69. The overall flying qualities of the CH-47B are assigned a pilot rating of A3 (para 11).

DEFICIENCIES AND SHORTCOMINGS AFFECTING MISSION ACCOMPLISHMENT

70. There were no deficiencies disclosed which would effect the mission accomplishment of the CH-47B helicopter (para 11).

71. Correction of the following shortcomings is desirable for improved operation and mission capability:

a. The lack of a V_{NE} computer or cruise guide indicator installed in the cockpit (para 16).

b. The static longitudinal instability at all airspeeds below 70 KIAS (para 45).

c. The unstable dynamic longitudinal characteristics at all test conditions (para 54).

d. The excessive cockpit vibrations above 120 KIAS at light gross weights (below approximately 33,000 pounds) and 230 rotor rpm (para 61).

RECOMMENDATIONS

72. The shortcomings should be corrected at the earliest convenience.

73. A V_{NE} computer or cruise guide indicator should be installed in the CH-47B helicopter showing the V_{NE} for both 225 and 230 rotor rpm (para 45).

74. Consideration should be given to retrofitting the CH-47B with self-tuning absorbers in the cockpit area to reduce vibration levels (para 61).

75. The data contained in this report should be incorporated in the pilot's handbook.

APPENDIX I. REFERENCES

1. Report, D8-0314, Vertol Division of The Boeing Company. *CH-47 Product Improvement Program Configuration 1A and II*, 24 May 1966.

2. Letter, USATECOM, AMSTE-BG, subject: Test Directive, Product Improvement Tests, CH-47B Helicopter, 17 June 1966.

3. Specification, 114-PJ-602, Vertol Division of The Boeing Company, *Detail Specification for the Model CH-47B Helicopter*, 22 September 1966.

4. Military Specification, MIL-H-8501A, *Helicopter Flying and Ground Handling Qualities, General Requirements For*, 7 September 1961 with Amendment 1, 3 April 1962.

5. Technical Manual, TM 55-1520-227-10, *Operator's Manual, Army Model CH-47B and CH-47C Helicopters*.

6. Specification, 114-FT-600, Vertol Division of The Boeing Company, *CH-47 Configuration 1A Flight Test Procedure*.

7. Model Specification, T55-L-7C, *Shaft Turbine Engine Lycoming LTC4B-8C Specification No. 124.31*, 15 June 1966.

APPENDIX II. PERFORMANCE GUARANTEES AND TEST RESULTS

Item	Guarantee	Test Results
Maximum cruise speed at SL, standard day, NRP and a 33,000-pound grwt	150 KTAS	158 KTAS
Service ceiling, single engine, MRP and a 29,924-pound grwt (Mission I grwt)	6000 ft	6950 ft actual climb, 7070 ft computed from level-flight data
Radius of action, Mission I, 6000 pounds payload outbound, 3000 pounds payload inbound	100 NM	106 NM
Hover OGE for 10 minutes at a 29,924-pound grwt, 95°F day	6000 ft	7400 ft
Hover OGE, SL, standard day, maximum power	38,000 lb	40,000 lb
Payload guarantee, 100 NM radius, Mission I	6000 lb outbound, 3000 lb inbound	7313 lb outbound, 3653 lb inbound

APPENDIX III. TEST TECHNIQUES AND DATA ANALYSIS METHODS

GENERAL

1. The equations and data analysis methods used to correct test day conditions to US standard day conditions are briefly described in this appendix.

2. The basic nondimensional helicopter equations were used and are defined as follows:

$$C_P = \frac{SHP \times 550}{\rho A\ (\Omega R)^3} \tag{1}$$

$$C_T = \frac{W}{\rho A\ (\Omega R)^2} \tag{2}$$

$$\mu = \frac{1.6889 \times V_T}{\Omega R} \tag{3}$$

$$M_{tip} = \frac{0.5921 \times \Omega R + V_T}{38.942 \times \sqrt{T}} \tag{4}$$

where: C_P = Power coefficient

SHP = Engine output shaft horsepower

ρ = Air density (slugs/ft^3)

A = Total rotor swept area (ft^2)

Ω = Rotor angular velocity (rad/sec)

R = Rotor radius (ft)

C_T = Thrust coefficient

W = Gross weight (lb)

μ = Advance ratio

V_T = True velocity (kts)

M_{tip} = Advancing tip Mach number

T = Ambient temperature (°K)

3. Significant compressibility effects were encountered at high M_{tip}. In order to best attain the effects of compressibility, the above equations were redefined as follows:

From equation (1):

$$C_P = \frac{SHP \times 550}{\rho A \; (\Omega R)^3}$$

also: $$\rho = \rho \frac{\rho_o}{\rho_o} = \sigma \rho_o = \frac{\delta}{\sqrt{\theta}} \rho_o \frac{\sqrt{\theta}}{\theta} = \frac{\delta\sqrt{\theta}}{\sqrt{\theta}^3} \rho_o = 1$$

$$\Omega R = \frac{2\pi}{60} \times N_R \times R$$

where: ρ_o = Sea level standard day air density (slugs/ft^3)

σ = Density ratio

δ = Pressure ratio

θ = Temperature ratio

N_R = Rotor rotational speed (rpm)

therefore:

$$C_P = \frac{SHP}{\delta\sqrt{\theta}} \times \frac{550}{\rho_o \; AR^3} \times \frac{1}{\left(\frac{2\pi}{60} \times \frac{N_R}{\sqrt{\theta}}\right)^3} \qquad (5)$$

4. Using equations 2, 3, 4 and the previous procedures, we get:

$$C_T = \frac{W}{\delta} \times \frac{1}{\rho_o \; AR^2} \times \frac{1}{\left(\frac{2\pi}{60} \times \frac{N_R}{\sqrt{\theta}}\right)^2} \qquad (6)$$

$$\mu = 1.6889 \frac{V_T}{\sqrt{\theta}} \times \frac{1}{\frac{2\pi}{60} \times \frac{N_R}{\sqrt{\theta}}} \times \frac{1}{R} \qquad (7)$$

$$M_{tip} = K_1 \times R \times \frac{N_R}{\sqrt{\theta}} + K_2 \frac{V_T}{\sqrt{\theta}} \qquad (8)$$

where: $K_1 = 9.5736 \times 10^{-5}$

$K_2 = 1.51176 \times 10^{-3}$

POWER DETERMINATION

5. The fuel-flow method was used to determine engine output shp. Through the history of Chinook programs, the engine torquemeter has proved to be inaccurate. Extensive efforts by Vertol Division of The Boeing Company, Lycoming and US Air Force personnel resulted in the conclusion that the fuel-flow method was most accurate and represented the actual power being developed for T55 engines.

6. Fuel-flow rate was recorded on an oscillograph. The resultant fuel flow was then changed to referred conditions based on the engine inlet duct characteristics. Referred shp was then found at the corresponding referred fuel flow by using a curve based on Lycoming test-stand engine calibration. The actual shp was determined by unreferring the referred shp and applying corrections for ram and nonoptimum power turbine speed.

HOVER

7. Hover performance was determined IGE and OGE by the tethered hover technique. Limited free-flight hover data were also acquired to verify the first technique. Equations 5, 6 and 8 were used to define the hover capability.

8. A plot of C_P versus C_T was constructed for a selected wheel height. At the same wheel height, separate curves were defined for different $N_R/\sqrt{\theta}$. Compressibility effects were determined by comparing the C_P required for a constant C_T at various $N_R/\sqrt{\theta}$'s.

9. Hover performance characteristics may be extracted from these curves in preparing tables or curves for flight manuals for any combination of conditions.

TAKEOFF

10. Takeoff performance was determined using constant wheel height acceleration. Each takeoff was initiated at the power required to hover at a 10-foot reference wheel height.

11. Equations 1, 2 and the ΔC_p parameter were used to correlate the takeoffs. ΔC_p is defined as the difference between the test maximum power available at a 50- or 100-foot obstacle and the power required to hover at a 10-foot reference wheel height.

12. For each ΔC_p, a plot was constructed to relate the distance required to clear a 50- or 100-foot obstacle and the selected climb-out airspeed through the obstacle. Finally, the individual ΔC_p's were combined to form carpet plots. These plots became the tools used to predict takeoff performance for any excess power condition. Also, any required set of takeoff distances may be determined by the proper use of these plots.

CLIMBS

13. All climbs were flown at the best climb airspeed which was obtained from level-flight performance data. Best climb airspeed is defined as the airspeed for minimum power required in level flight.

14. Sawtooth climbs were flown to determine the power coefficient (K_p) and weight coefficient (K_w). K_p and K_w are used to solve the difference in rate of climb (R/C) caused by the difference in shaft horsepower and gross weight, respectively. These differences occur when the performance of an installed test engine is corrected to a model specification engine for standard day conditions.

15. The equations are:

$$\Delta R/C = K_p \left(\frac{\Delta SHP}{W_t}\right) \times 33{,}000 \qquad (9)$$

$$\Delta R/C = K_w \times SHP_s \times 33{,}000 \left(\frac{1}{W_s} - \frac{1}{W_t}\right) \qquad (10)$$

where: ΔSHP = Standard shaft horsepower available minus test shaft horsepower measured

W_t = Test gross weight

SHP_s = Standard shaft horsepower acquired from a model specification engine

W_s = Standard gross weight

16. Continuous climbs were conducted to determine service ceilings. The initial rate of climb (dh/dt) was corrected to tapeline rate of climb (R/C_t) by the equation:

$$R/C_t = \frac{dh}{dt} \frac{T_{a_t}}{T_{a_s}} \qquad (11)$$

where: T_{a_t} = Test ambient air temperature (°K)

T_{a_s} = Standard ambient air temperature (°K)

17. The standard rate of climb was finally determined by correcting the tapeline rate of climb for shaft horsepower and gross weight differences using equations 9 and 10.

Summarization:

$$R/C_s = R/C_t + \Delta R/C_p + \Delta R/C_w \qquad (12)$$

LEVEL FLIGHT

18. Level-flight speed-power performance was determined by using equations 5 through 8. Each speed power was flown at a pre-determined W/δ and $N/\sqrt{\theta}$. To maintain W/δ approximately constant, altitude was increased as fuel was consumed. $N/\sqrt{\theta}$ was held constant by increasing or decreasing rotor speed as the ambient air temperature increased or decreased, respectively.

19. The raw data was reduced to referred terms: $SHP_t/\delta\sqrt{\theta}$, $V_T/\sqrt{\theta}$, W_t/δ, $N_R/\sqrt{\theta}$. Each point was then corrected to unaccelerated airspeed, zero rate of climb or descent, aim W_t/δ and aim $N_R/\sqrt{\theta}$. These were done by the following methods:

a. Acceleration-deceleration correction theory:

$F = M\ a$

where: F = Force

M = Mass (W/g)

a = Acceleration ($\Delta V_T/\Delta t$)

$$\Delta F = \frac{W}{g} \times \frac{\Delta V_T}{\Delta t}$$

$$\Delta F \times V_T = \frac{W}{g} \times \frac{\Delta V_T}{\Delta t} \times V_T$$

$$\Delta SHP = \frac{W}{g} \times \frac{\Delta V_T}{\Delta t} \times \frac{V_T}{550}$$

$$\frac{\Delta SHP}{\delta\sqrt{\theta}} = \frac{1}{\delta\sqrt{\theta}} \times \frac{\sqrt{\theta}}{\sqrt{\theta}} \times \frac{W}{g} \times \frac{\Delta V_T}{\Delta t} \times \frac{V_T}{550}$$

$$\frac{\Delta SHP}{\delta\sqrt{\theta}} = \frac{W}{\delta} \times \frac{\Delta V_T}{\sqrt{\theta}} \times \frac{V_T}{\sqrt{\theta}} \times \frac{\sqrt{\theta}}{\Delta t \times g \times 550}$$

$$\frac{\Delta SHP}{\delta\sqrt{\theta}} = \frac{W}{\delta} \times \frac{\Delta V_T/\sqrt{\theta}}{\Delta t} \times \frac{V_T}{\sqrt{\theta}} \times \frac{\sqrt{\theta}}{g \times 550} \qquad (13)$$

where: $\frac{\Delta SHP}{\delta\sqrt{\theta}}$ = Change in referred shaft horsepower (shp)

$\frac{W}{\delta}$ = Referred test gross weight (lb)

$\frac{\Delta V_T/\sqrt{\theta}}{\Delta t}$ = Change in referred true airspeed per unit change of time (ft/sec^2)

$\frac{V_T}{\sqrt{\theta}}$ = Referred true airspeed (ft/sec)

g = Acceleration of gravity (32.172 ft/sec^2)

Reduction:

A plot of $V_T/\sqrt{\theta}$ versus time was constructed and then a line was faired through the points. At a selected $V_T/\sqrt{\theta}$, the slope was found which gave $\Delta V_T/\sqrt{\theta} : \Delta t$. By using the values of $\Delta V_T/\sqrt{\theta} : \Delta t$ and the selected $V_T/\sqrt{\theta}$ in equation 13, the difference in $SHP/\delta\sqrt{\theta}$ can be solved for an unaccelerated airspeed.

b. Rate-of-climb or rate-of-descent correction:

Formulae:

From equation 9:

$$\Delta R/C = K_p\left(\frac{\Delta SHP}{W_t}\right) \times 33{,}000$$

$$\Delta SHP = \frac{\Delta R/C \times W_t}{K_p \times 33{,}000}$$

$$\frac{\Delta SHP}{\delta\sqrt{\theta}} = \frac{1}{\delta\sqrt{\theta}} \times \frac{\Delta R/C \times W_t}{K_p \times 33{,}000}$$

$$\frac{\Delta SHP}{\delta\sqrt{\theta}} = \frac{\dfrac{\Delta R/C}{\sqrt{\theta}} \times \dfrac{W_t}{\delta}}{K_p \times 33{,}000} \qquad (14)$$

Reduction:

A plot of pressure altitude (H_p) versus time was constructed, and a faired line was drawn through the points. At a selected H_p, the slope was found (dH_p/dt) which, in turn, was changed to tapeline rate of climb ($\Delta R/C_t$) by equation 11. By referring $\Delta R/C_t$ and by using equation 14, the change in $\Delta SHP/\delta\sqrt{\theta}$ was that obtained for zero rate of climb or descent.

c. Aim W_t/δ and $N/\sqrt{\theta}$ correction:

A graphical solution is applied to correct test W_t/δ and $N/\sqrt{\theta}$ to aim W_t/δ and $N/\sqrt{\theta}$. This method is invalid for a large correction.

The test points are first corrected for acceleration and rate of climb or descent as prescribed previously. Secondly, plots are constructed for $SHP/\delta\sqrt{\theta}$ versus $V_T/\sqrt{\theta}$ at lines of constant W_t/δ for a given $N/\sqrt{\theta}$; $SHP/\delta\sqrt{\theta}$ versus W_t/δ at lines of constant $V_T/\sqrt{\theta}$ for a given $N/\sqrt{\theta}$; $SHP/\delta\sqrt{\theta}$ versus $N/\sqrt{\theta}$ at lines of constant W_t/δ for a given $V_T/\sqrt{\theta}$. The faired lines for all three plots must cross. The last plot will show the effects of compressibility.

At the aim W/δ, enter plot No. 2 and find the slope $(\Delta SHP/\delta\sqrt{\theta} \div \Delta W/\delta)$ at each $V_T/\sqrt{\theta}$. Construct a plot of $\Delta SHP/\delta\sqrt{\theta} \div \Delta W/\delta$ versus $V/\sqrt{\theta}$. At the test $V/\sqrt{\theta}$, find the corresponding $\Delta SHP/\delta\sqrt{\theta} \div \Delta W/\delta$ which, in turn, is multiplied by the difference of test to aim W/δ. The resultant $\Delta SHP/\delta\sqrt{\theta}$ is the W/δ correction.

The same procedure is used to solve for the $\Delta SHP/\delta\sqrt{\theta}$ for a $\Delta N/\sqrt{\theta}$. Plot No. 3 is used, and a plot of $\Delta SHP/\delta\sqrt{\theta}$: $\Delta N/\sqrt{\theta}$ versus $V_T/\sqrt{\theta}$ is constructed.

APPENDIX IV. INSTRUMENTATION

PILOT'S PANEL

Boom airspeed
Sensitive rotor speed
Sensitive boom altimeter
Longitudinal stick position indicator
Lateral stick position indicator
Pedal position indicator
Thrust level position indicator
Angle of sideslip
Rate of climb indicator
Photopanel event switch
Record light

PHOTOPANEL

Boom airspeed
Ship's system airspeed
Rotor speed
Gas producer speed (N_1) (both engines)
Boom altitude
Ship's system altimeter
Compressor inlet temperature (both engines)
Exhaust gas temperature (both engines)
Free air temperature
Rate of climb
Fuel flow stepper motor (both engines)
Event switch
Event light
Correlation counter
Record coder
Camera counter
Time of day
Torque (both engines)
Fuel totalizer
Fuel temperature

OSCILLOGRAPH 1 (Multicolored channels)

Rotor speed (blip)
Vertical vibration at FS 50
Vertical vibration at FS 95

Vertical vibration at FS 120
Vertical vibration at FS 320
Lateral vibration at FS 50
Lateral vibration at FS 95
Lateral vibration at FS 120
Lateral vibration at FS 320
Engine fuel flow (cycles) (both engines)
Pilot's and engineer's event
Correlation counter
Record coder
Aft pivoting actuator load
Aft swiveling actuator load
Aft fixed link load
Compressor inlet pressure

OSCILLOGRAPH 2

Rotor speed (blip)
Rotor speed (linear)
Gas producer speed (N_1) (both engines)
Longitudinal stick position
Pedal position
Thrust lever position
SAS pitch position (both actuators)
SAS roll position (both actuators)
SAS yaw position (both actuators)

APPENDIX V. TEST DATA

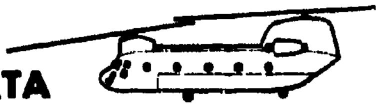


FIGURE NO. 1

O.G.E. HOVER CAPABILITY COMPARISON

ROTOR SPEED = 230 R.P.M.

NOTES:

1. CH-47A EMPTY WEIGHT = 18458 LB.
2. CH-47B EMPTY WEIGHT = 20068 LB.
3. CH-47A POWER AVAILABLE BASED ON MODEL SPEC. T55-L-7 LYCOMING ENGINE SPEC. NO. 124.20A AMENDMENT NO. 4
4. CH-47B POWER AVAILABLE BASED ON MODEL SPEC. T55-L-7C LYCOMING ENGINE SPEC. NO. 124.31 15 JUNE 1961.
5. CH-47A HOVER DATA OBTAINED FROM CAT. II PERFORMANCE TESTS OF THE CH-47A HELICOPTER, FTC-TR-66-2.
6. CH-47B HOVER DATA OBTAINED FROM FIG. 3 AND 238.

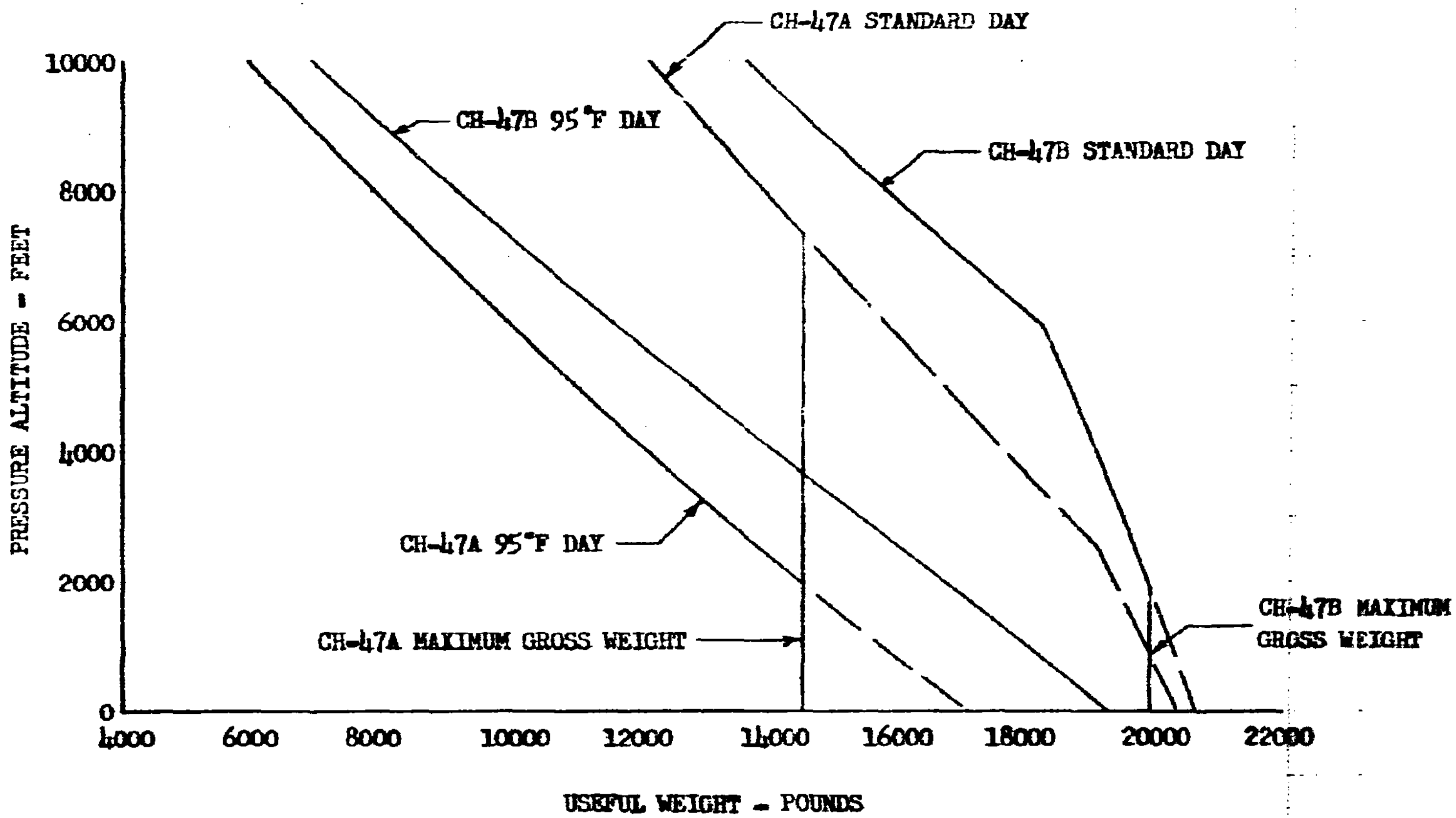


FIGURE NO. 2

HOVERING PERFORMANCE SUMMARY

CH-47B U.S.A. S/N 66-19100

T55-L-7C MODEL SPECIFICATION

MAXIMUM RATED POWER

230 R.P.M.

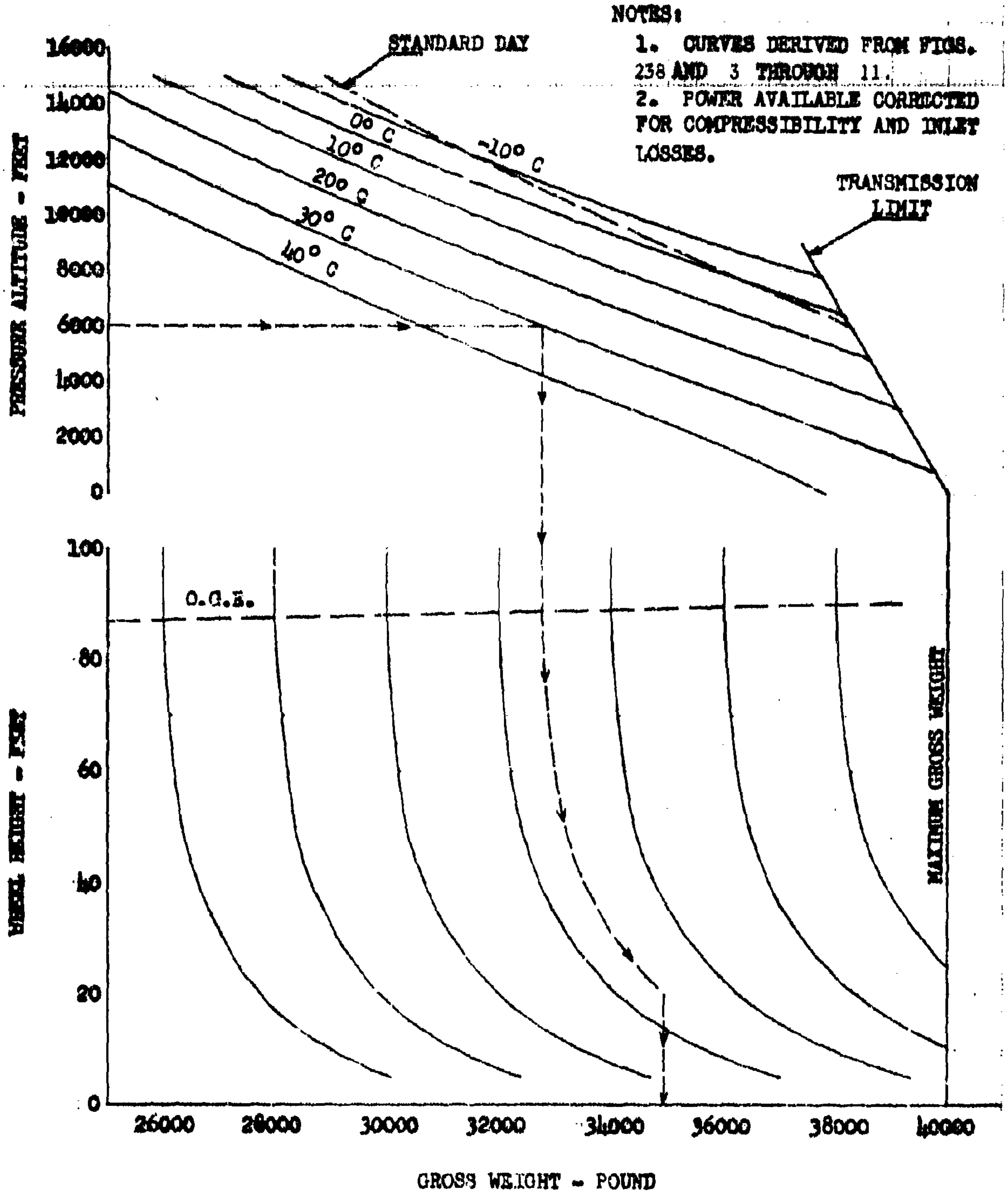
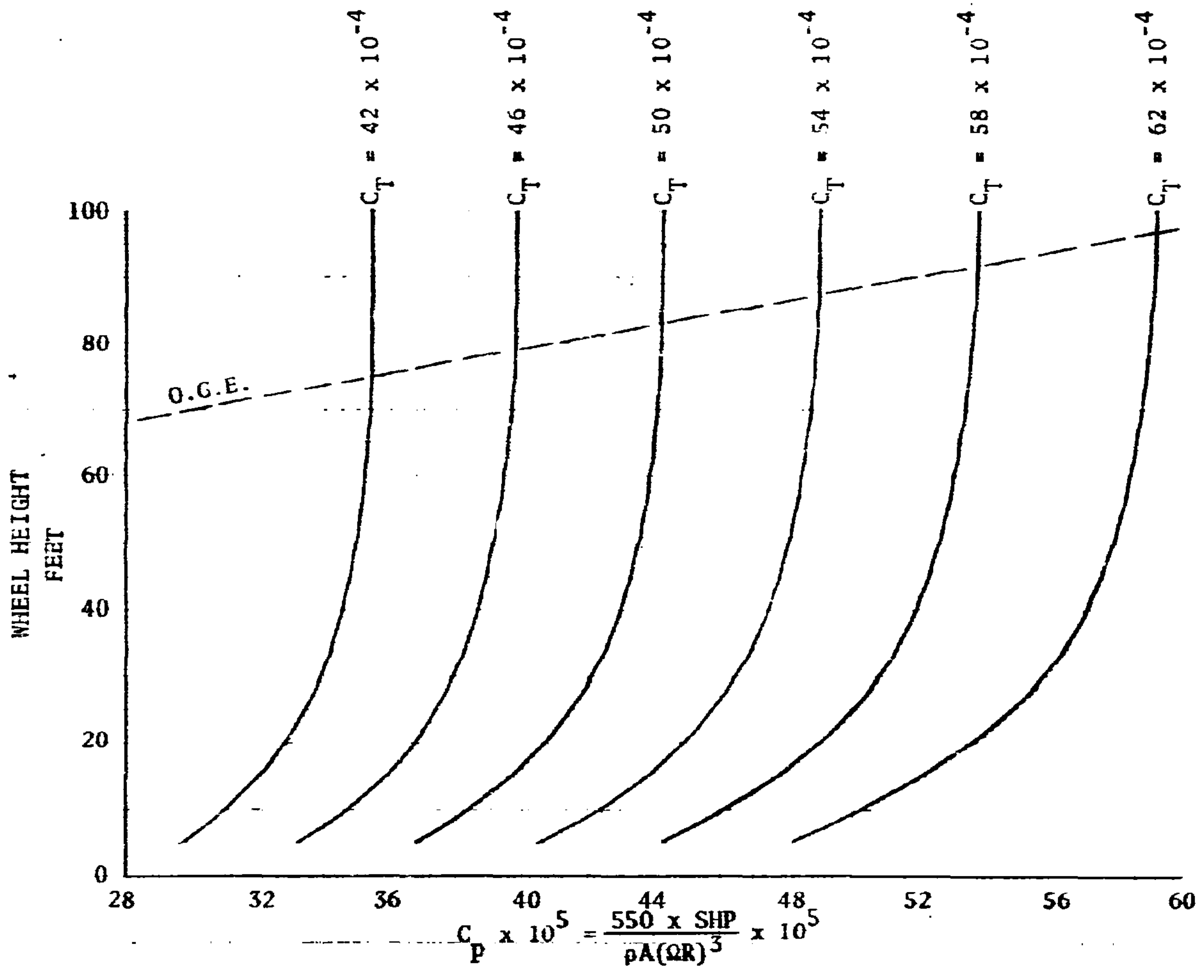


FIGURE NO. 3

NON-DIMENSIONAL HOVERING PERFORMANCE SUMMARY

CH-47B U.S.A. S/N 66-19100

T55-L-7C S/N LEO 3202 & LEO 3204



NOTES:

1. CURVES DERIVED FROM FIGURES 4 THROUGH 11.
2. WHEEL HEIGHT MEASURED FROM THE BOTTOM OF THE RIGHT REAR WHEEL.
3. WIND LESS THAN 3 KNOTS
4. $N/\sqrt{\theta}$ = 230 R.P.M.
5. O.G.E. = OUT OF GROUND EFFECT.

FIGURE NO. 4
NON-DIMENSIONAL HOVERING PERFORMANCE
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3202 & LEO 3204

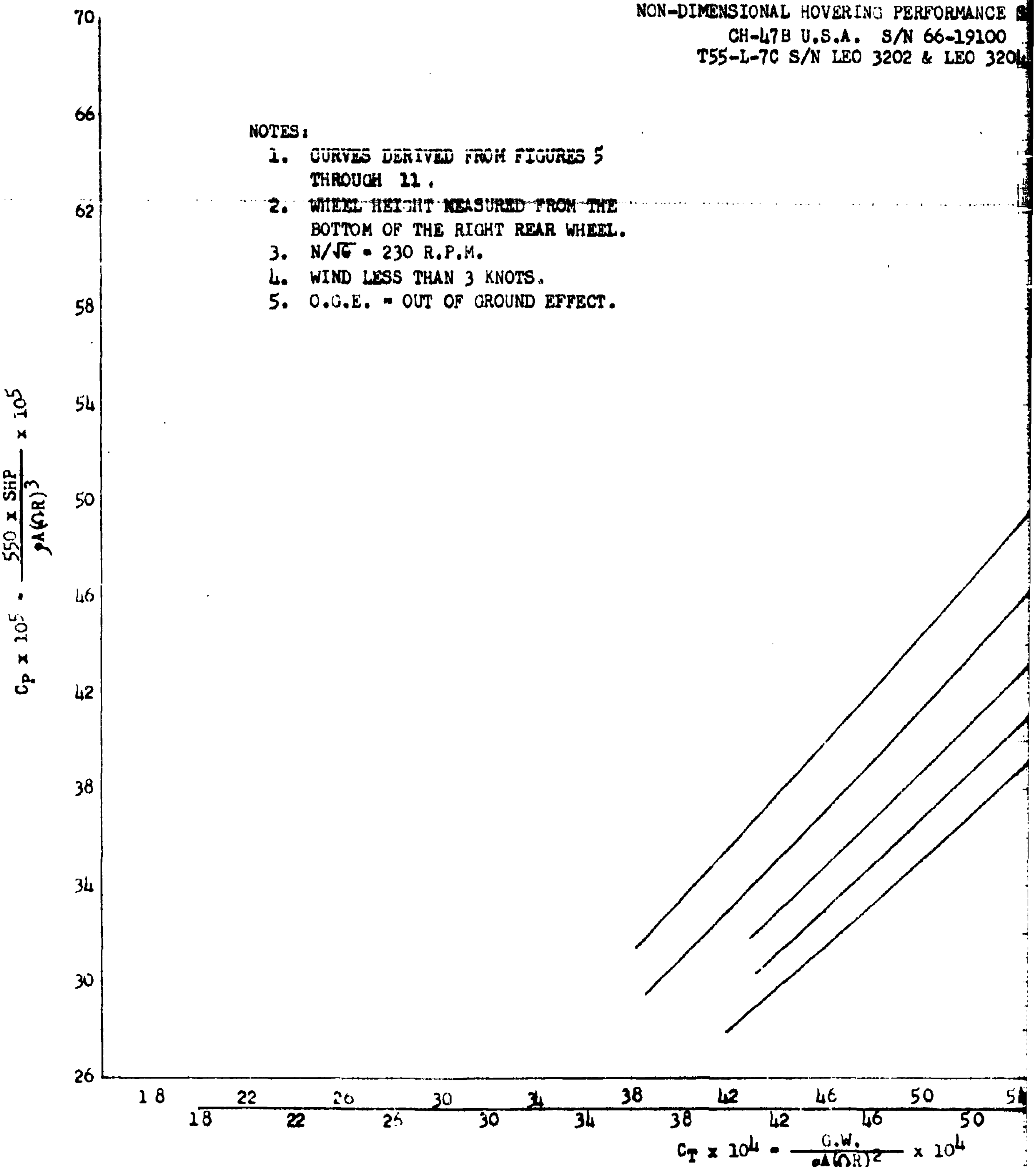
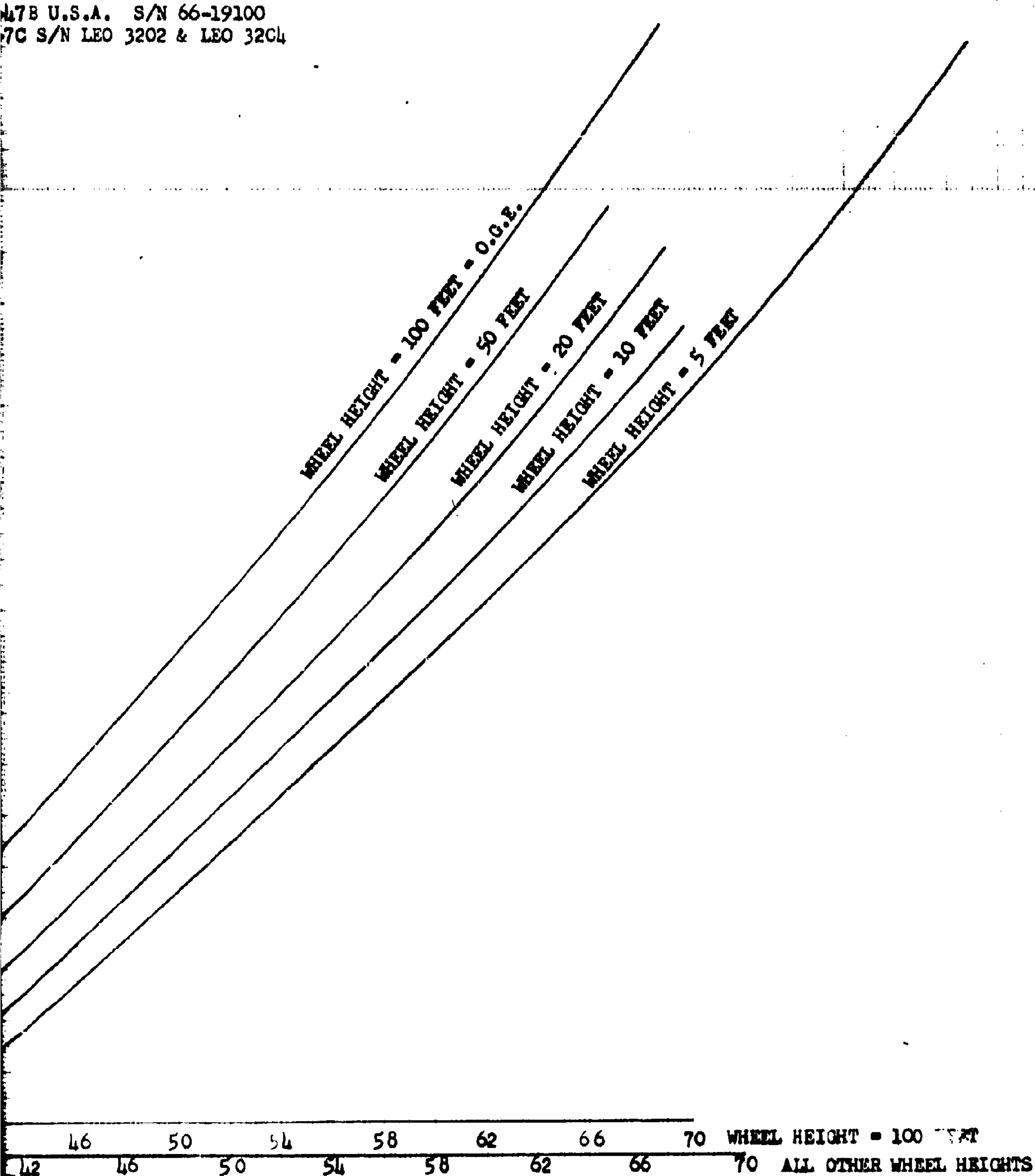


FIGURE NO. 4
NAL HOVERING PERFORMANCE SUMMARY
47B U.S.A. S/N 66-19100
7C S/N LEO 3202 & LEO 3204



$= \frac{G.W.}{\rho A(\Omega R)^2} \times 10^4$

2

FIGURE NO. 5

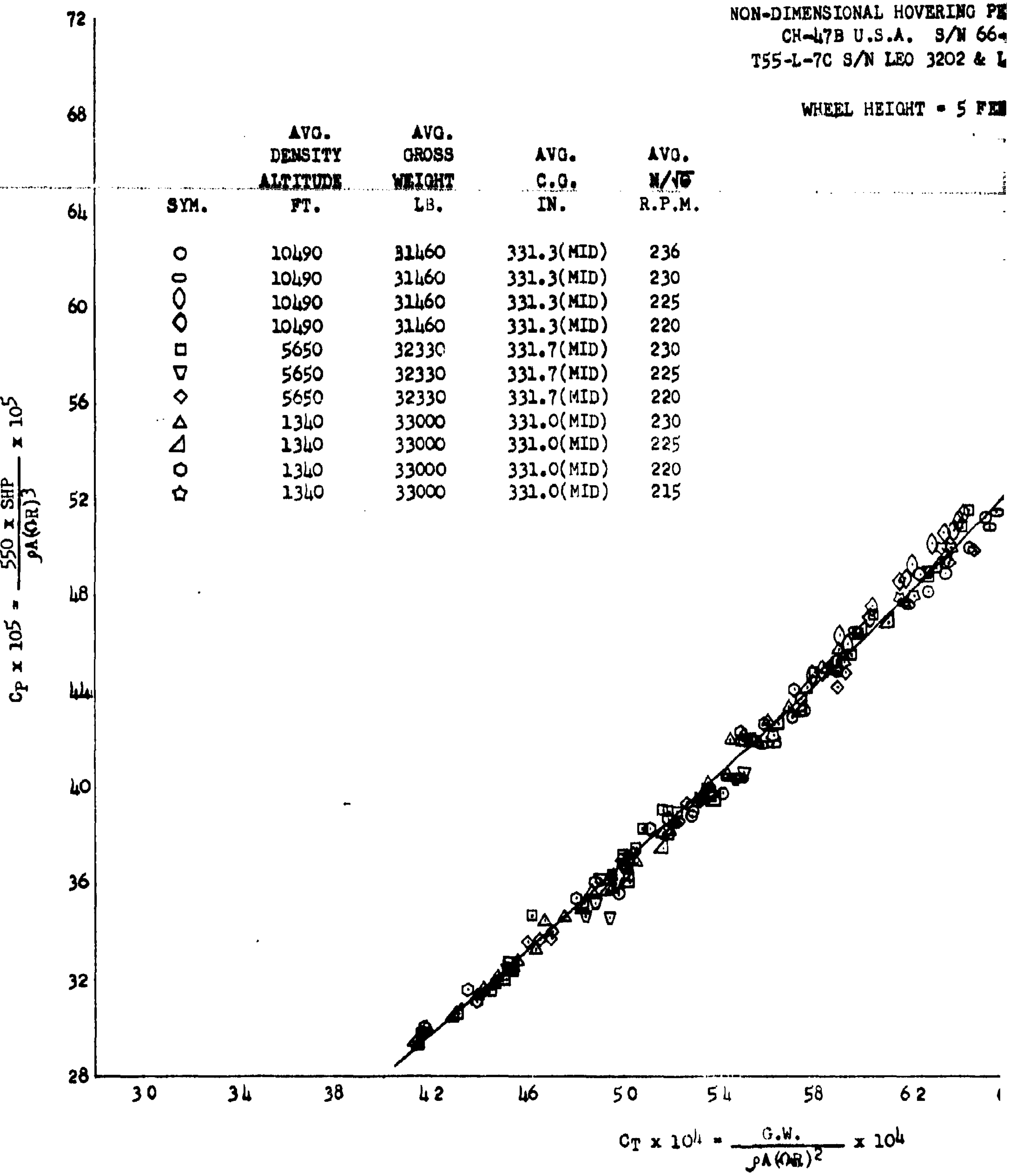
NON-DIMENSIONAL HOVERING PE

CH-47B U.S.A. S/N 66-

T55-L-7C S/N LEO 3202 & L

WHEEL HEIGHT = 5 FE

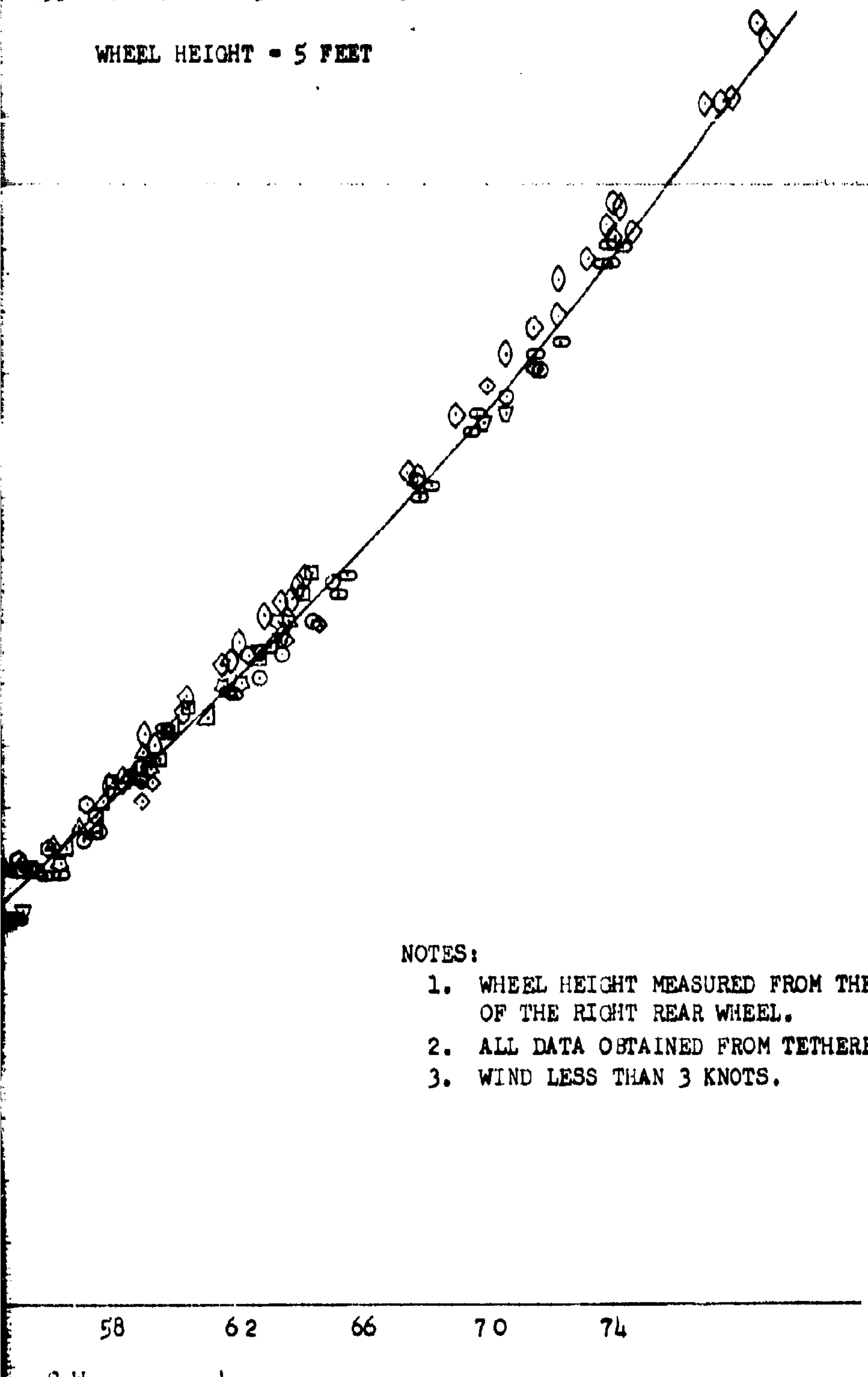
SYM.	AVG. DENSITY ALTITUDE FT.	AVG. GROSS WEIGHT LB.	AVG. C.G. IN.	AVG. $N/\sqrt{\theta}$ R.P.M.
○	10490	31460	331.3(MID)	236
⬭	10490	31460	331.3(MID)	230
⬯	10490	31460	331.3(MID)	225
◊	10490	31460	331.3(MID)	220
□	5650	32330	331.7(MID)	230
▽	5650	32330	331.7(MID)	225
◇	5650	32330	331.7(MID)	220
△	1340	33000	331.0(MID)	230
◺	1340	33000	331.0(MID)	225
⬡	1340	33000	331.0(MID)	220
☆	1340	33000	331.0(MID)	215



1

FIGURE NO. 5
NON-DIMENSIONAL HOVERING PERFORMANCE
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3202 & LEO 3204

WHEEL HEIGHT = 5 FEET



NOTES:
1. WHEEL HEIGHT MEASURED FROM THE BOTTOM OF THE RIGHT REAR WHEEL.
2. ALL DATA OBTAINED FROM TETHERED HOVER.
3. WIND LESS THAN 3 KNOTS.

2

FIGURE NO. 6
NON-DIMENSIONAL HOVERING PERFORMANCE
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3202 & LEO 3204

WHEEL HEIGHT = 10 FEET
$N/\sqrt{\theta}$ = 230 R.P.M.

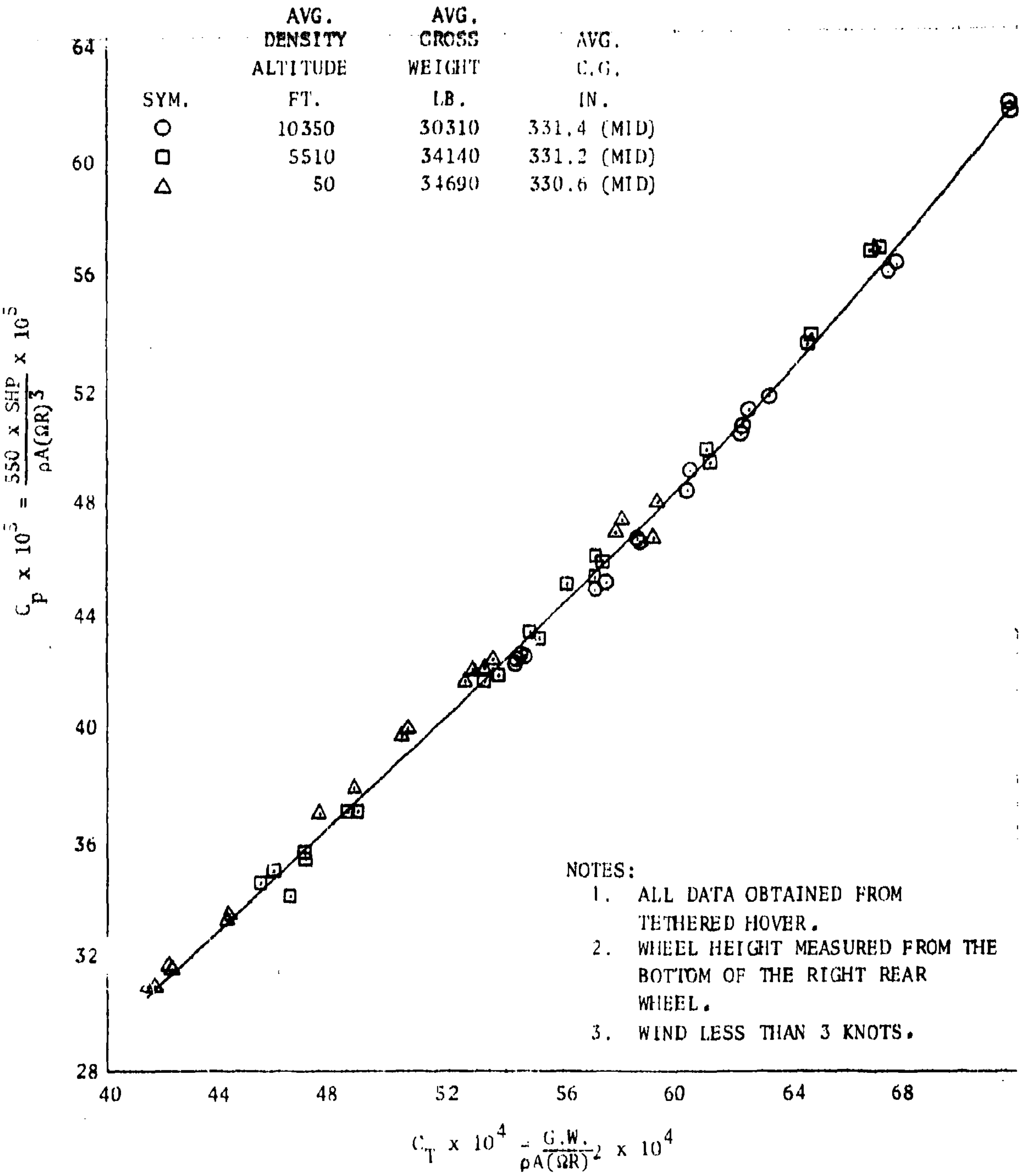


FIGURE NO. 7

NON-DIMENSIONAL HOVERING PERFORMANCE

CH-47B U.S.A. S/N 66-19100

T55-L-7C S/N LEO 3202 & LEO 3204

WHEEL HEIGHT = 20 FEET

$N/\sqrt{\theta}$ = 230 R.P.M.

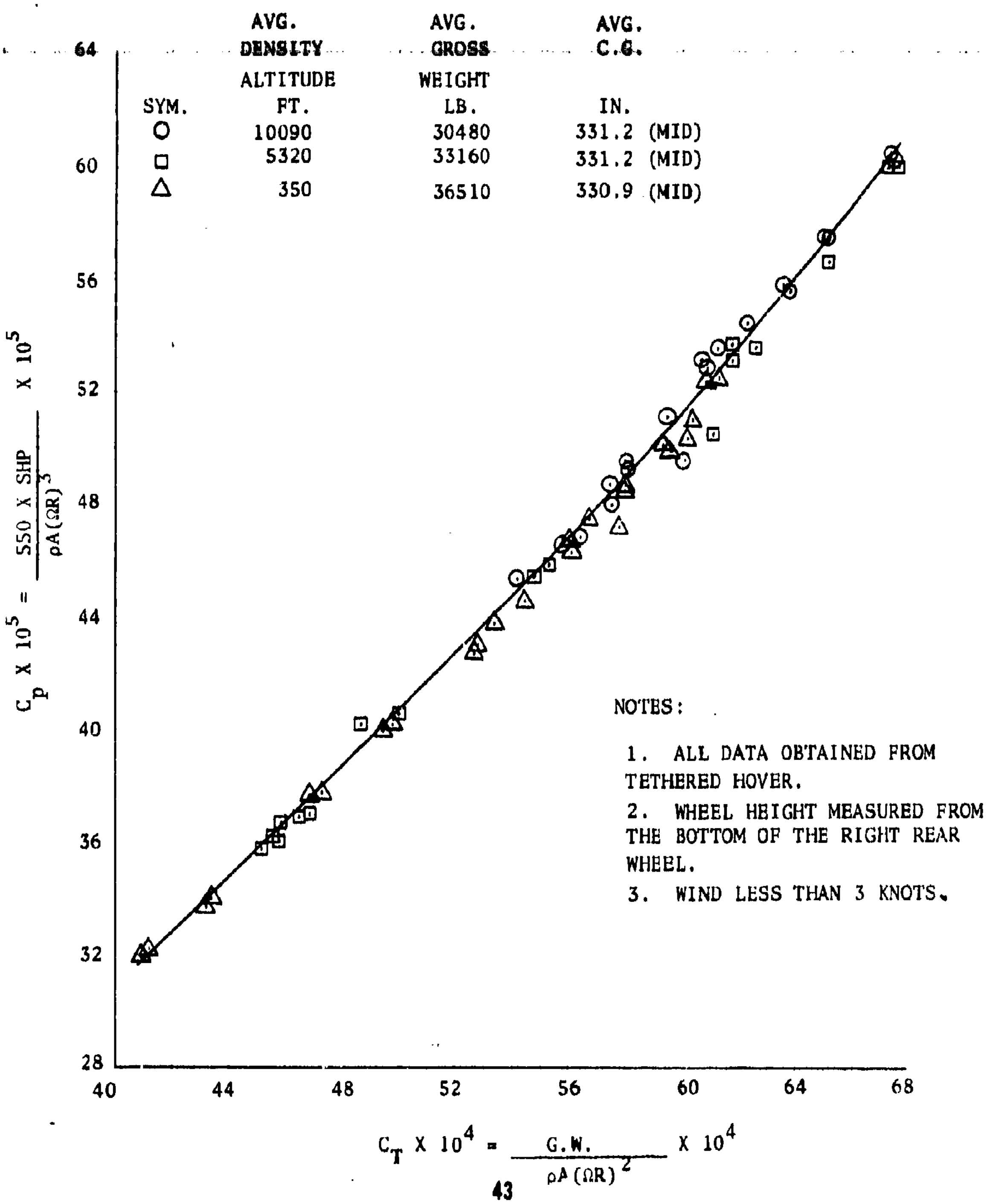


FIGURE NO. 8
NON-DIMENSIONAL HOVERING PERFORMANCE
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3202 & LEO 3204

WHEEL HEIGHT = 50 FEET
$N/\sqrt{\theta}$ = 230 R.P.M.

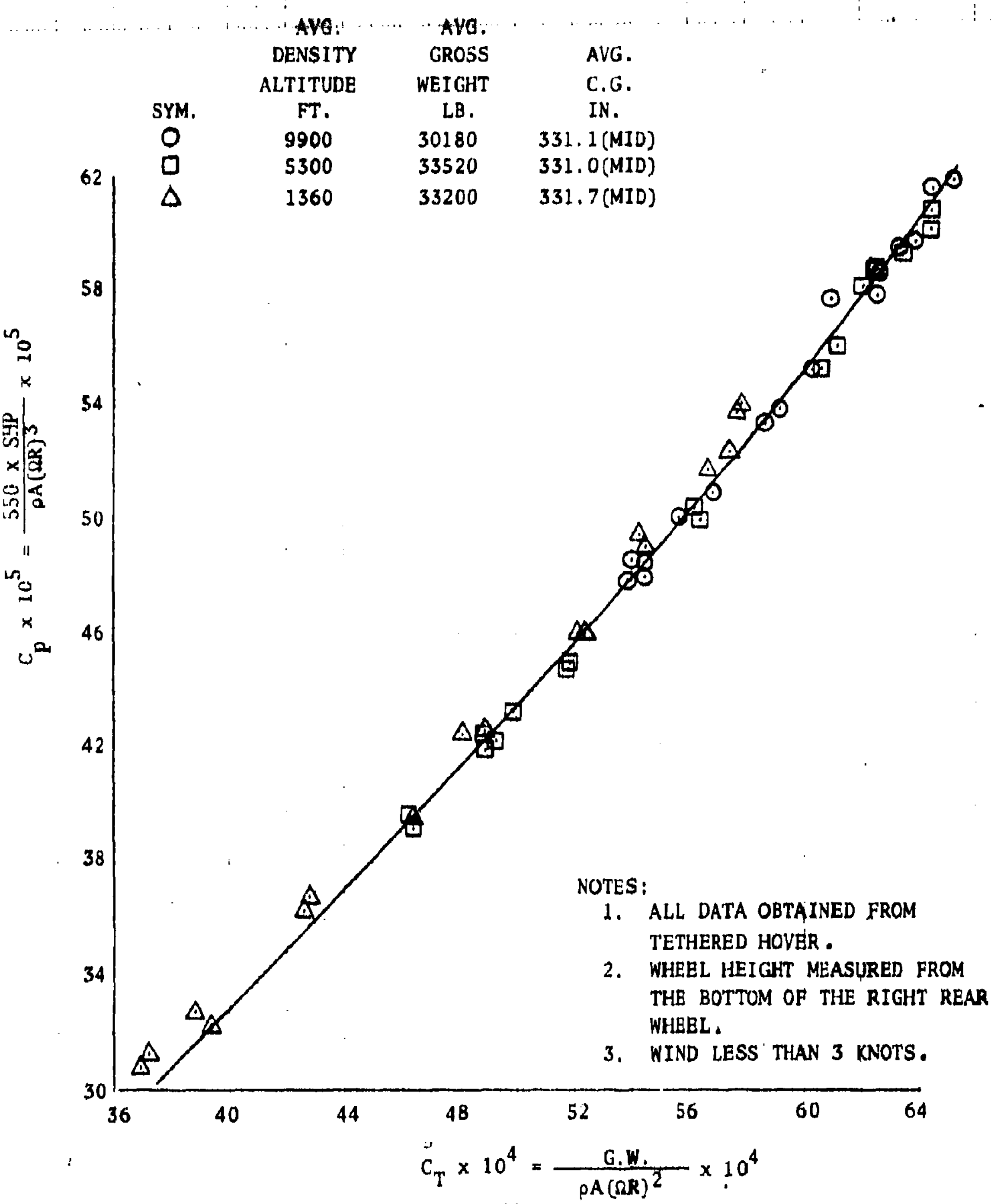


FIGURE NO. 9
NON-DIMENSIONAL HOVERING PERFORMANCE
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3202 & LEO 3204

WHEEL HEIGHT = 100 FEET

SYM.	AVG. DENSITY ALTITUDE FT.	AVG. GROSS WEIGHT LB.	AVG. C.G. IN.	AVG. $N/\sqrt{\theta}$ R.P.M.
◊	4270	29260	331.6(MID)	230
o	4270	29260	331.6(MID)	225
D	4270	29260	331.6(MID)	220
△	720	33030	331.9(MID)	230
◊	720	33030	331.9(MID)	225
⊿	720	33030	331.9(MID)	220
◻	720	33030	331.9(MID)	215

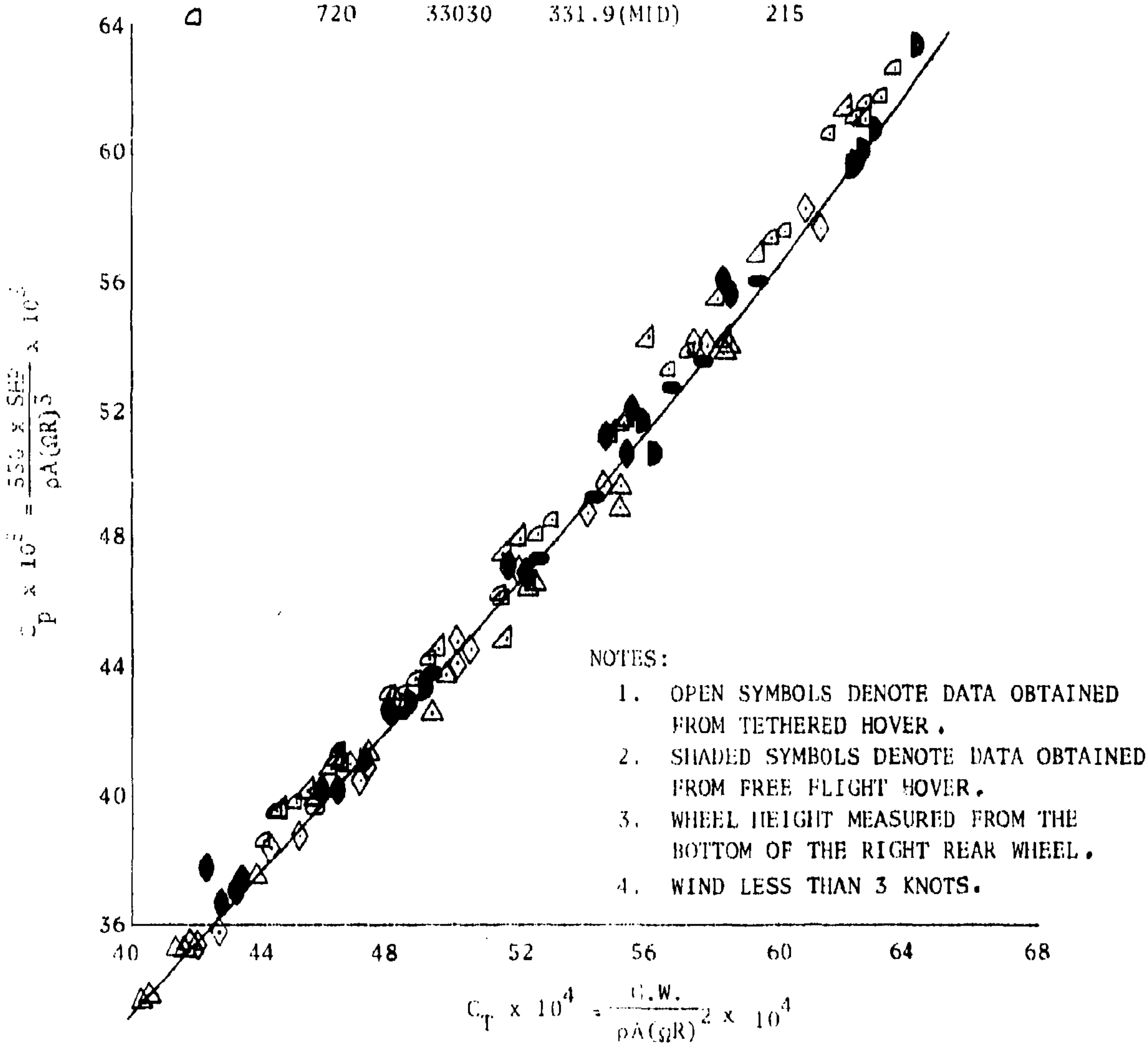


FIGURE NO. 10
NON-DIMENSIONAL HOVERING PERFORMANCE
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3202 & LEO 3204

WHEEL HEIGHT = 100 FEET

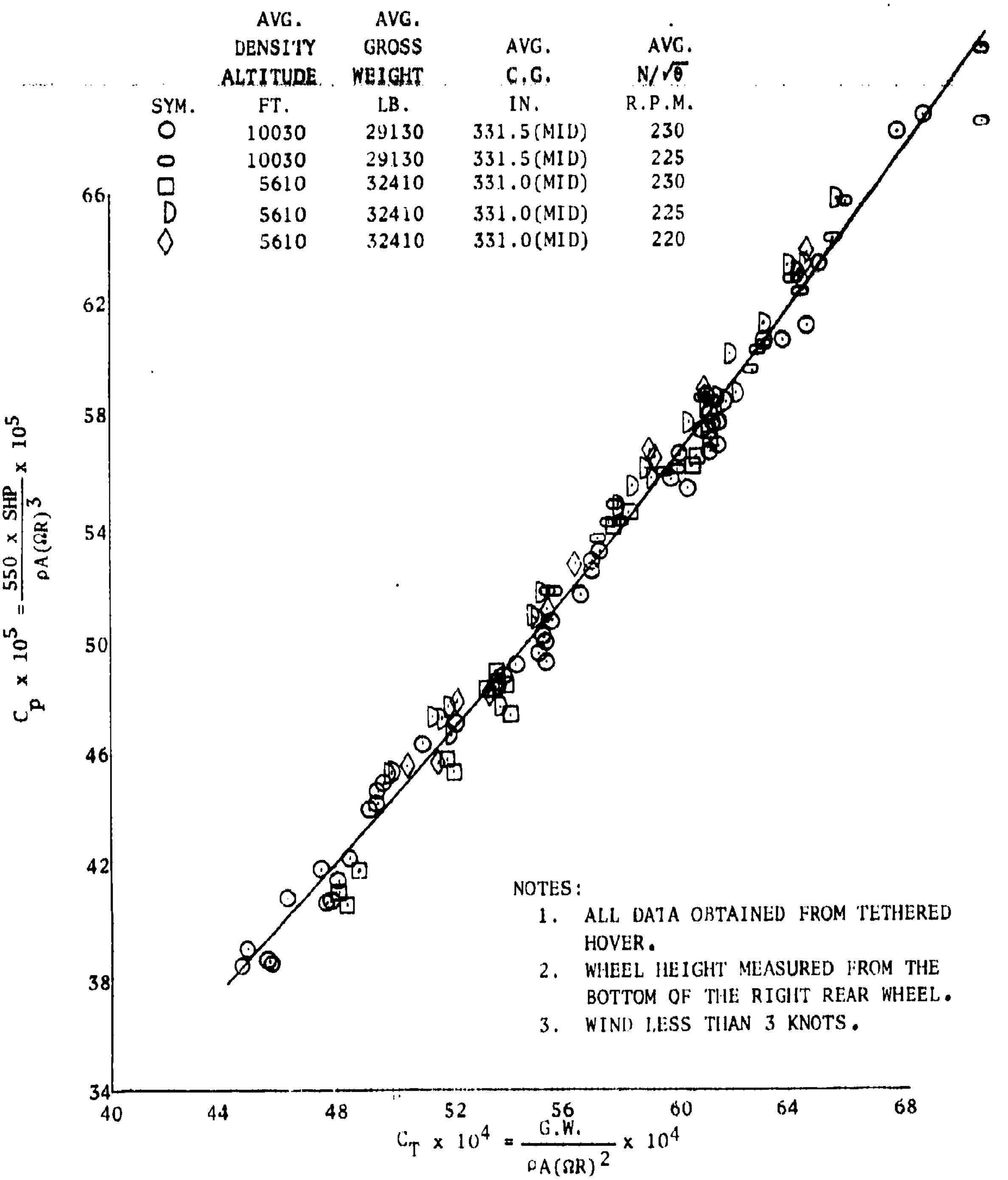


FIGURE NO. 11
NON-DIMENSIONAL HOVERING PERFORMANCE
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3202 & LEO 3204

WHEEL HEIGHT = 100 FEET

SYM.	AVG. DENSITY ALTITUDE FT.	AVG. GROSS WEIGHT LB.	AVG. C.G. IN.	AVG. $N/\sqrt{\theta}$ R.P.M.
O	9810	30520	331.1 (MID)	242
Δ	9980	29130	331.4 (MID)	236

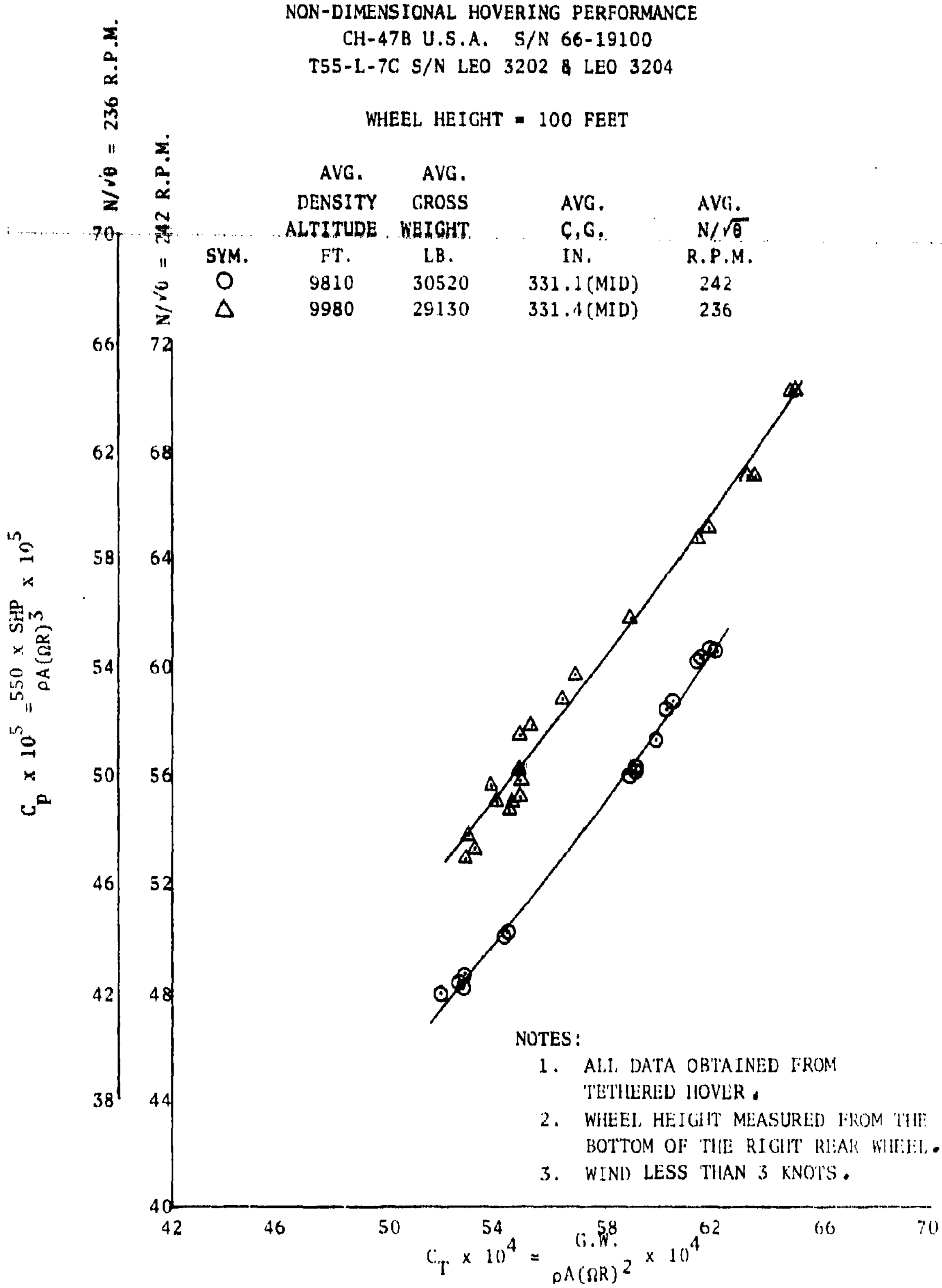


FIGURE NO. 12
LOSS IN GROSS WEIGHT CAPABILITY
DUE TO COMPRESSIBILITY IN HOVER
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3202 & LEO 3204

INDICATED ROTOR SPEED = 230 R.P.M.

NOTE: CURVES DERIVED FROM FIGURES 14 AND 238.

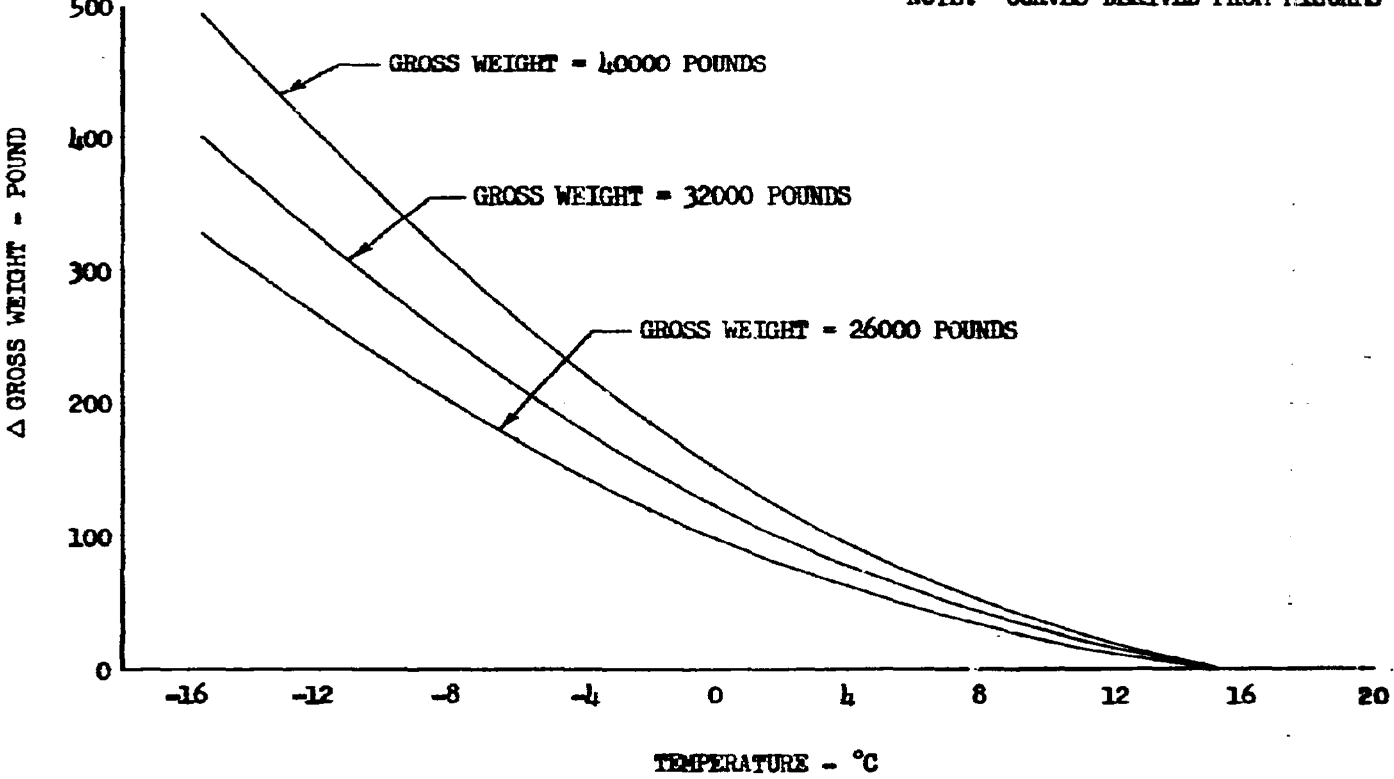


FIGURE NO. 13
COMPRESSIBILITY POWER
IN HOVER
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3202 & 3204

NOTES:
1. DATA POINTS OBTAINED FROM FIGURE 4.
2. CURVES FAIRED USING VERTOL NON-UNIFORM DOWNWASH THEORY.

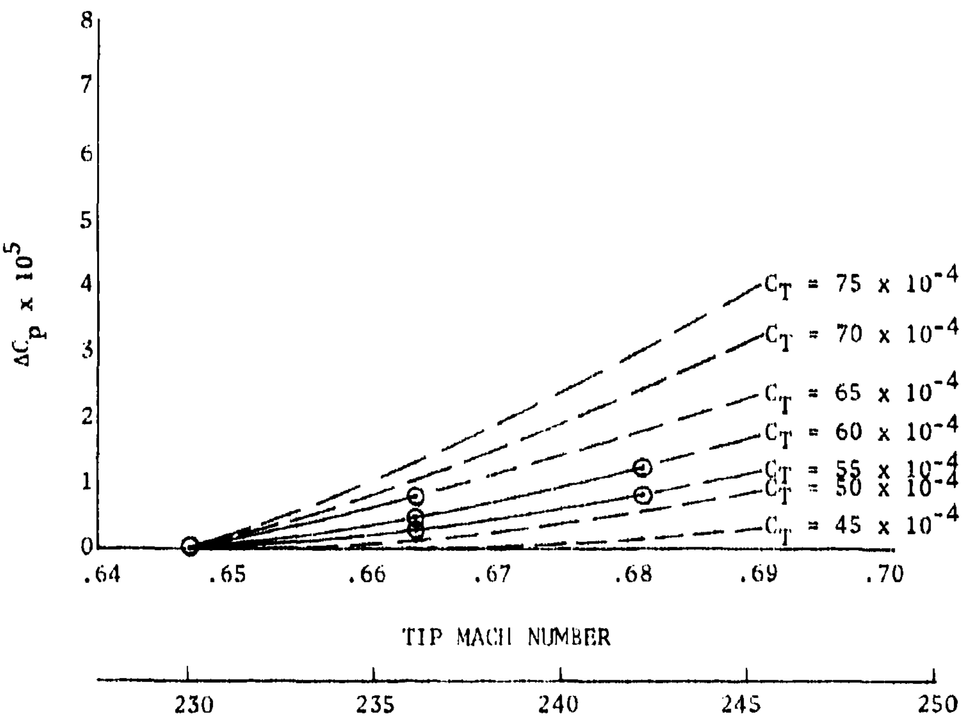


FIGURE NO. 14
NON-DIMENSIONAL OUT OF GROUND EFFECT
HOVERING PERFORMANCE SUMMARY
COMPRESSIBILITY EFFECTS

CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3202 & LEO 3204

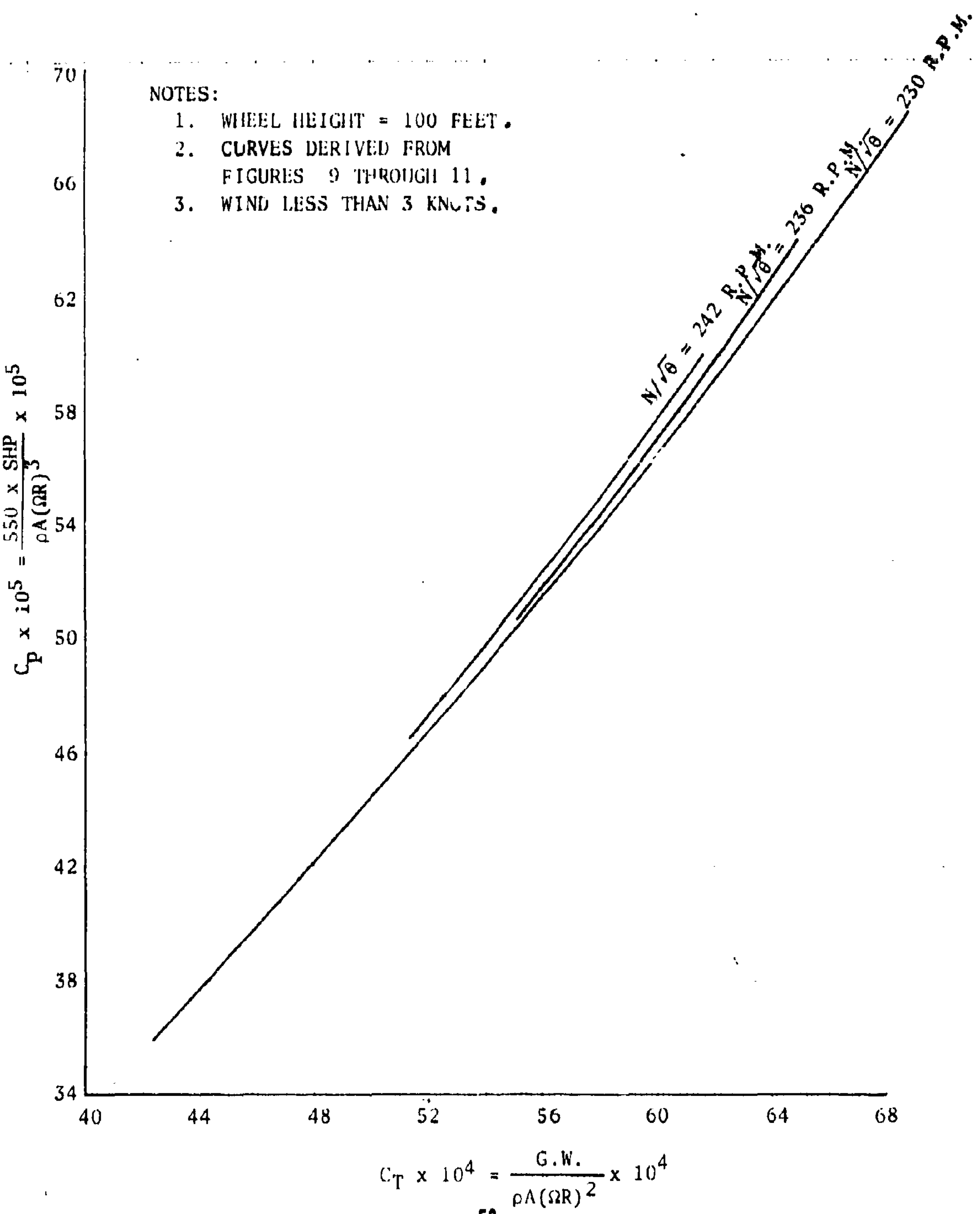


FIGURE NO. 15
LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100
SEA LEVEL STANDARD DAY
ROTOR SPEED = 230 R.P.M.
GROSS WEIGHT = 33000 LB.

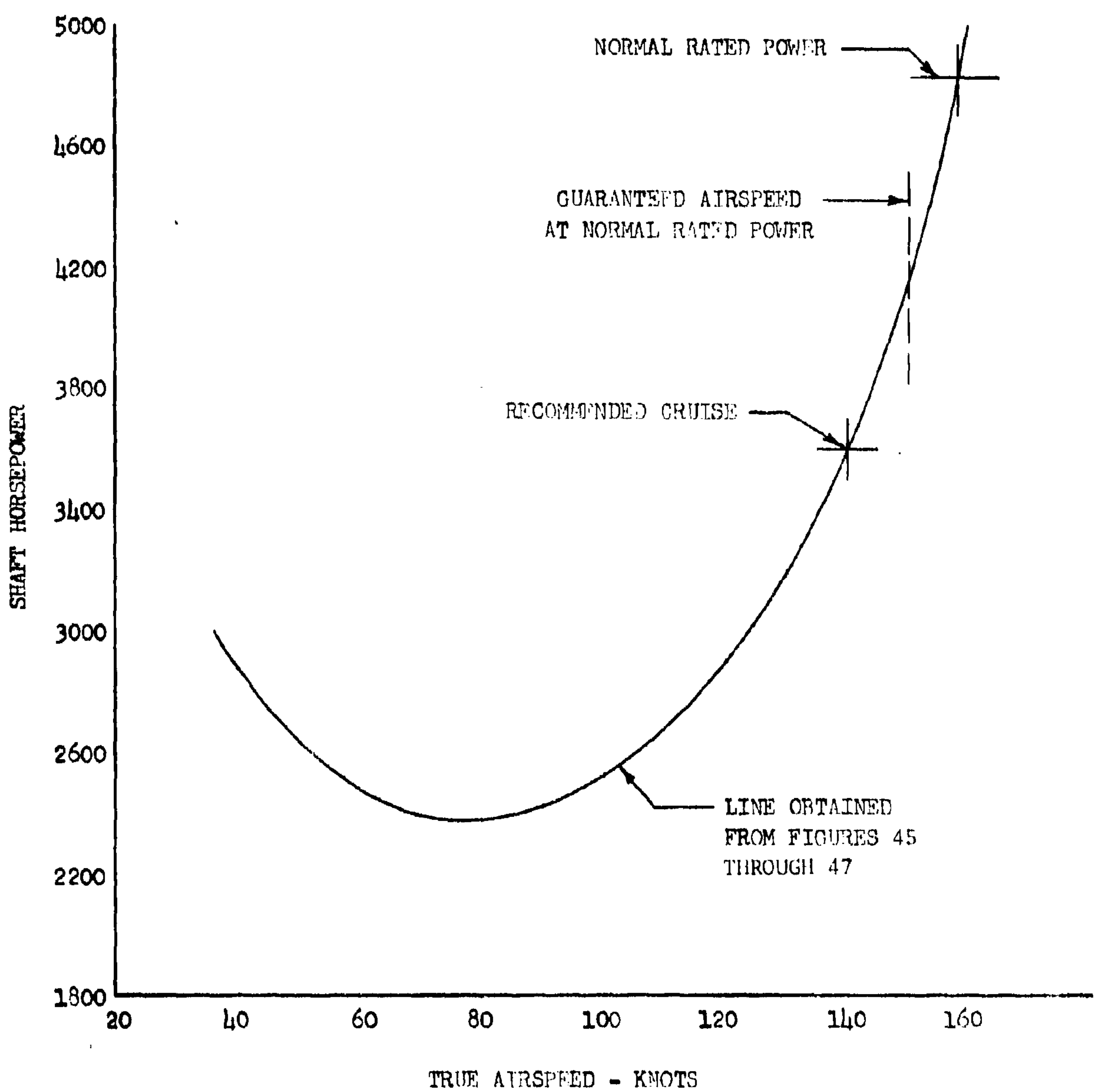


FIGURE NO. 16

LEVEL FLIGHT PERFORMANCE

CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
25740	226.8	331.0(MID)	0.004065	19.63

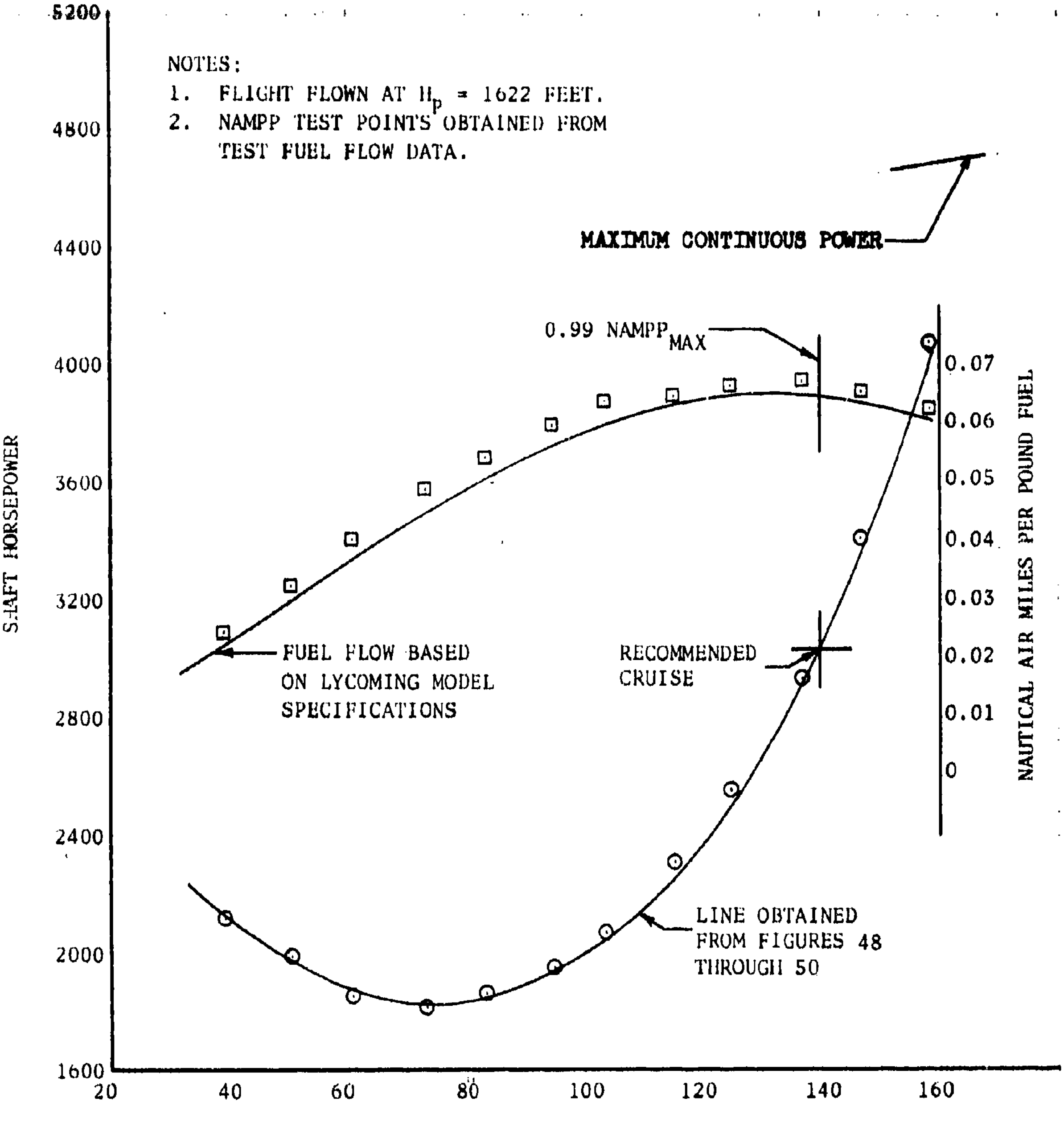


FIGURE NO. [illegible]

LEVEL FLIGHT PERFORMANCE

CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
25910	229.0	331.5(MID)	0.003933	12.50

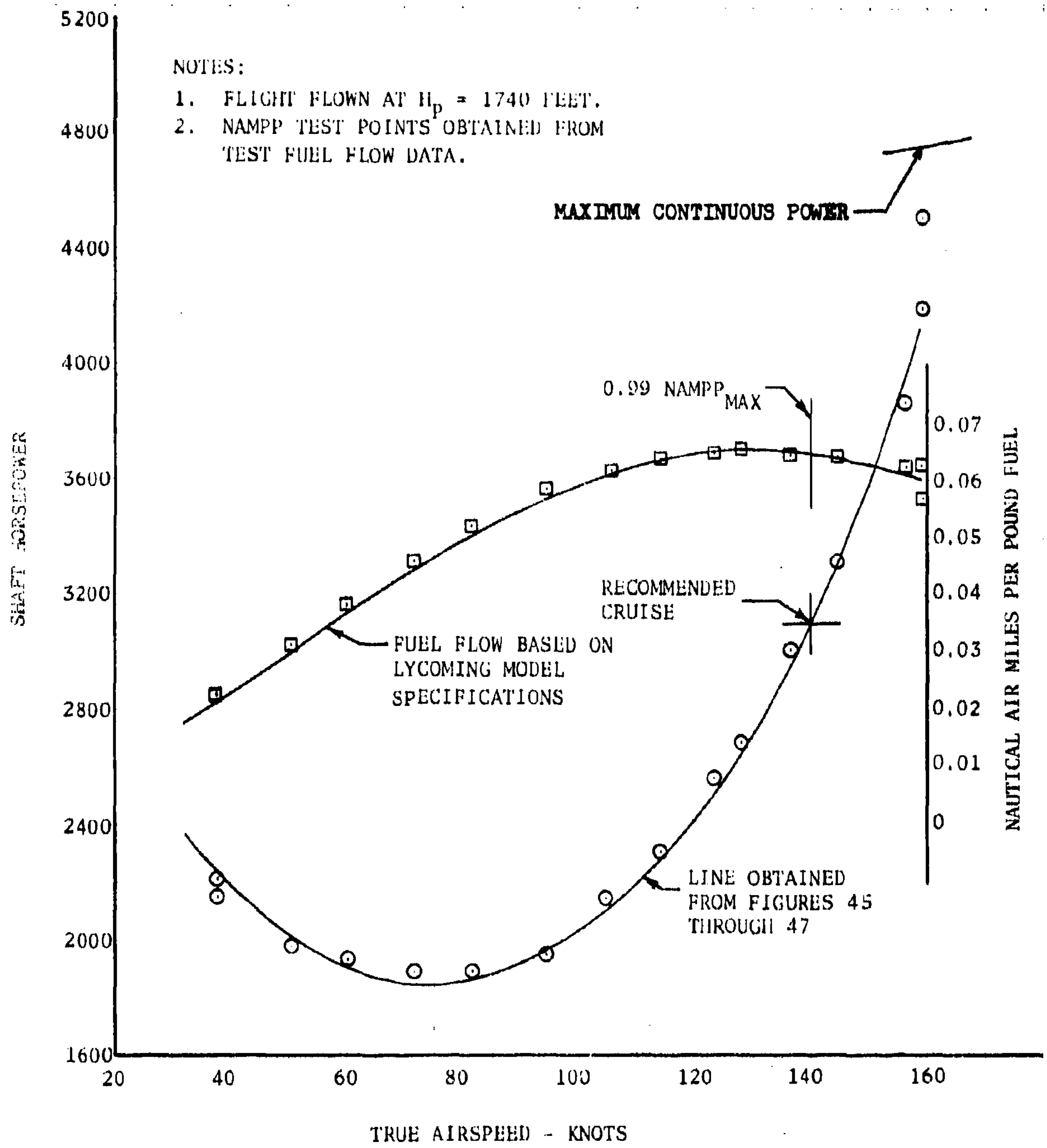


FIGURE NO. 18
LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
28350	226.2	331.5(MID)	0.004467	18.08

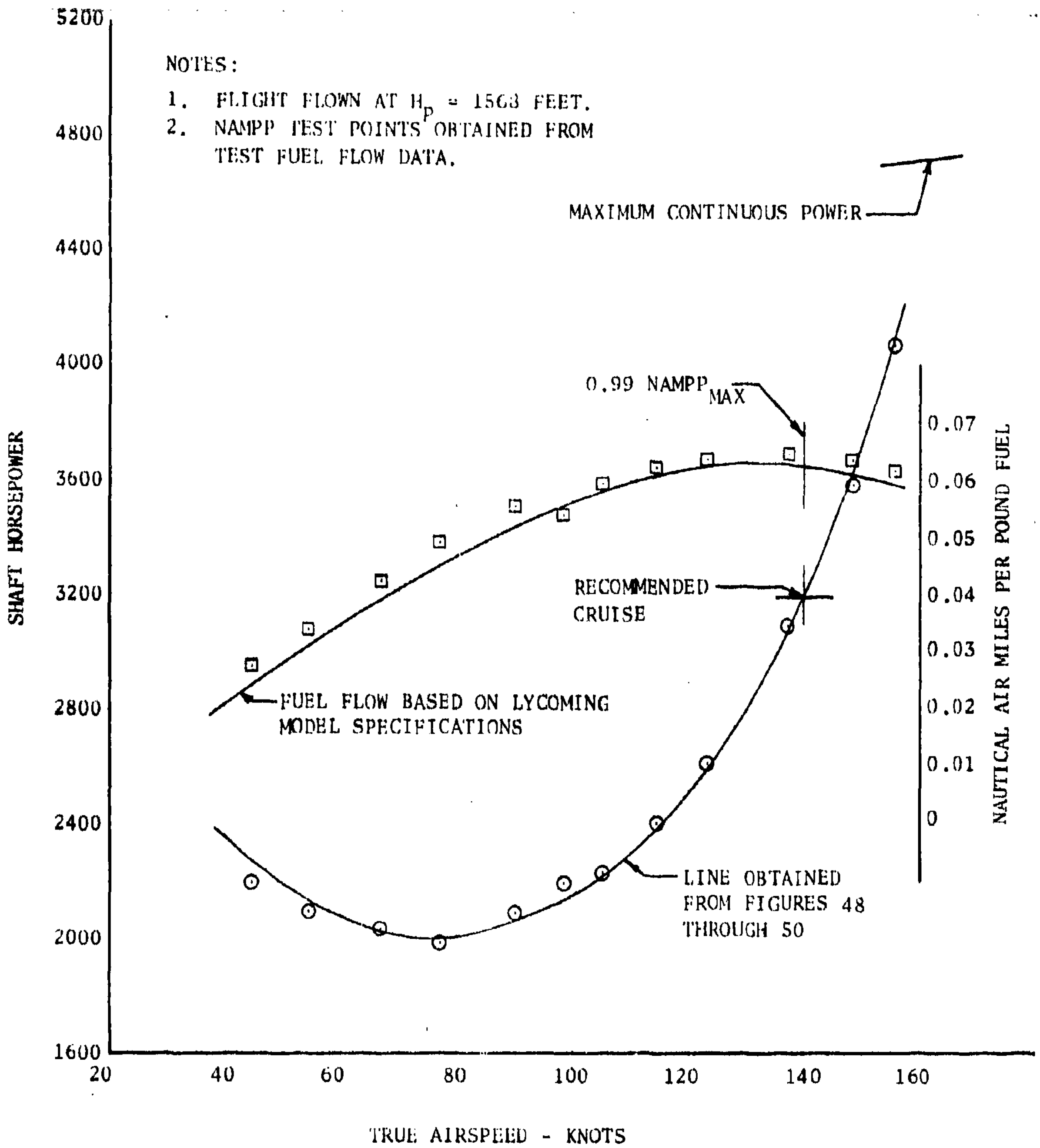


FIGURE NO. 19
LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
31420	230.3	330.9(MID)	0.004702	15.75

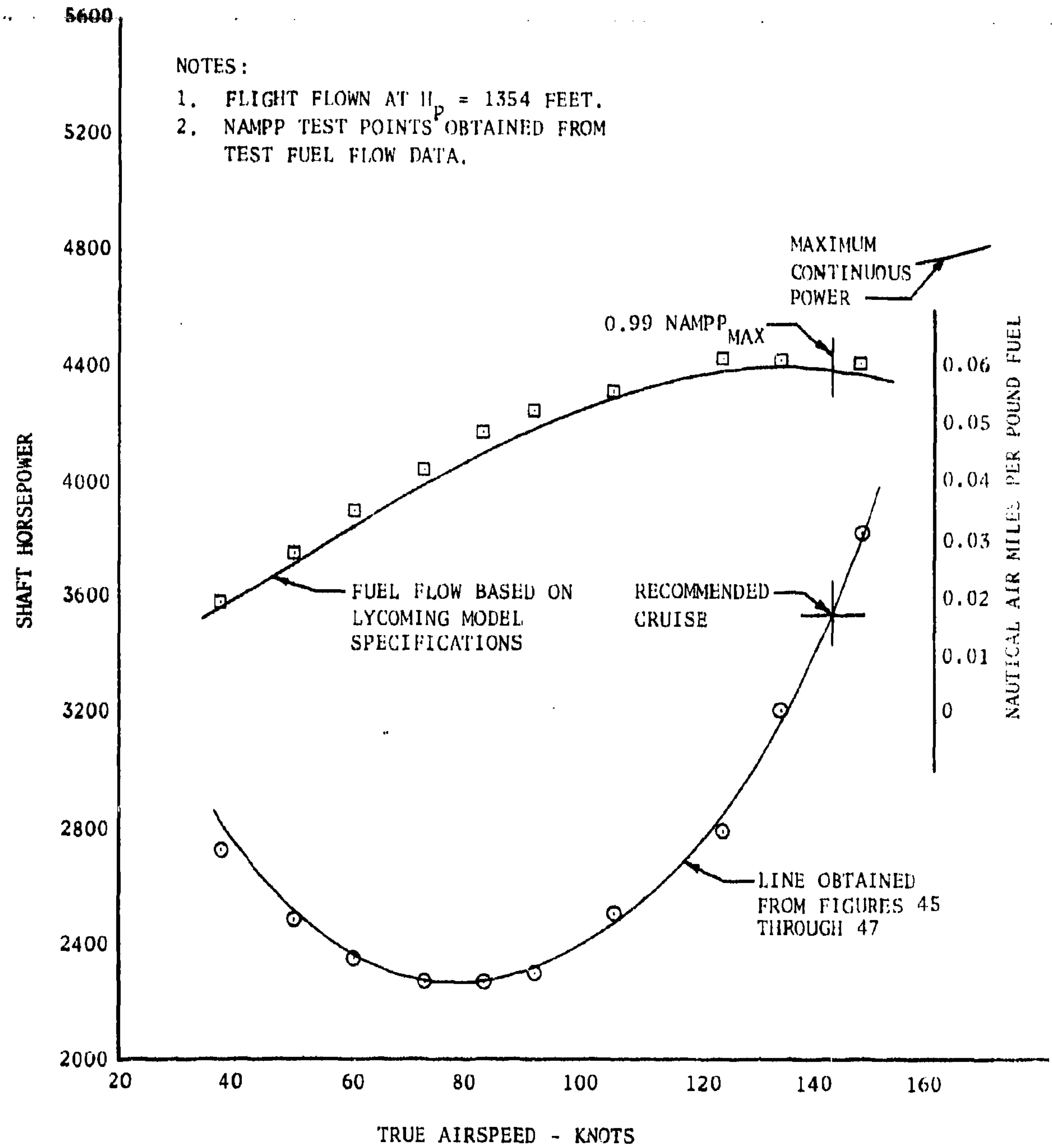
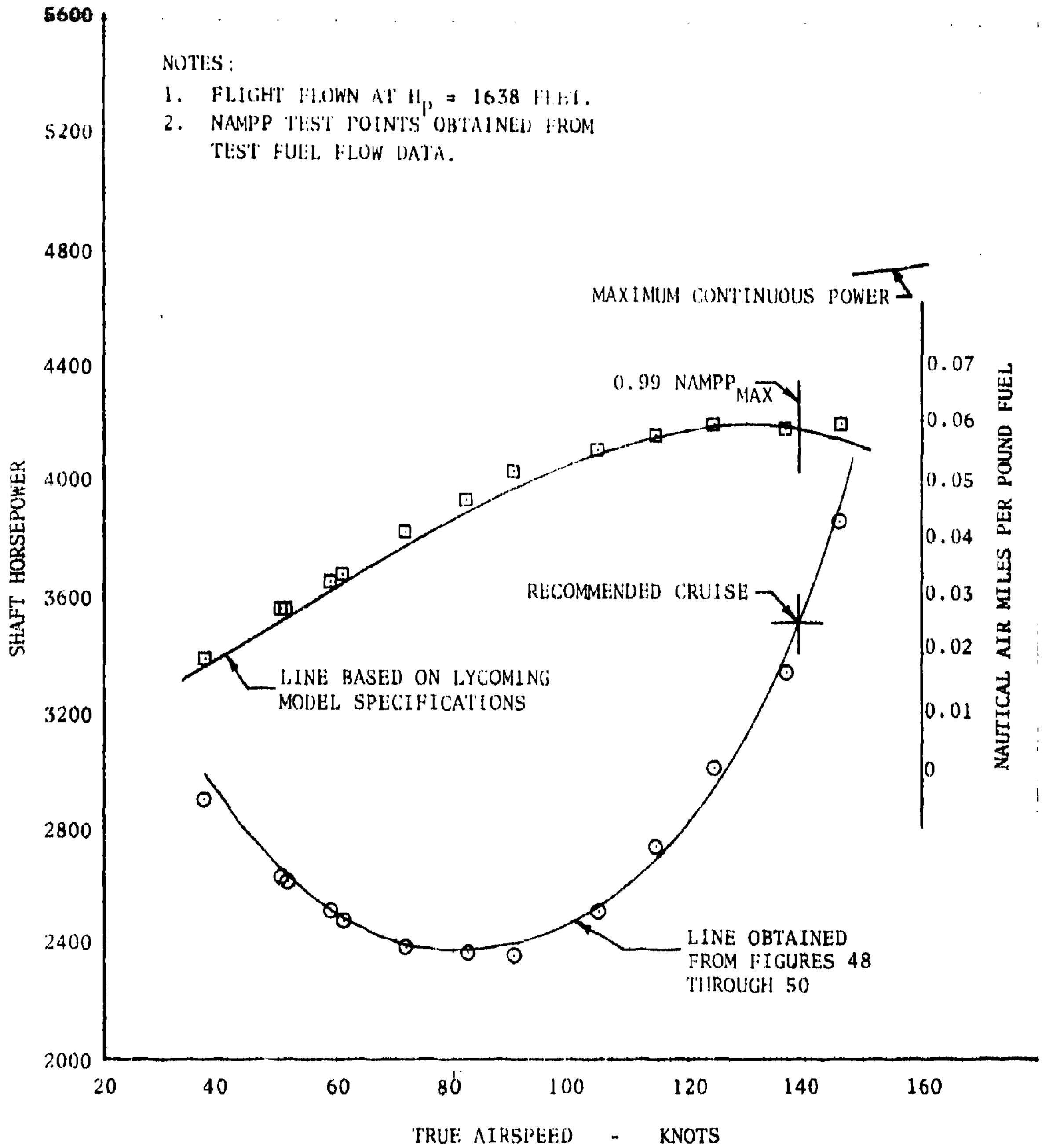


FIGURE [illegible]
LEVEL FLIGHT PERFORMANCE
CH-47B USA [illegible] 66-1910[illegible]

GROSS WEIGHT LB	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG O.A.T. °C
33460	224.9	330.8(MID)	0.005291	14.74



GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
39370	228.3	331.1(MID)	0.005914	10.75

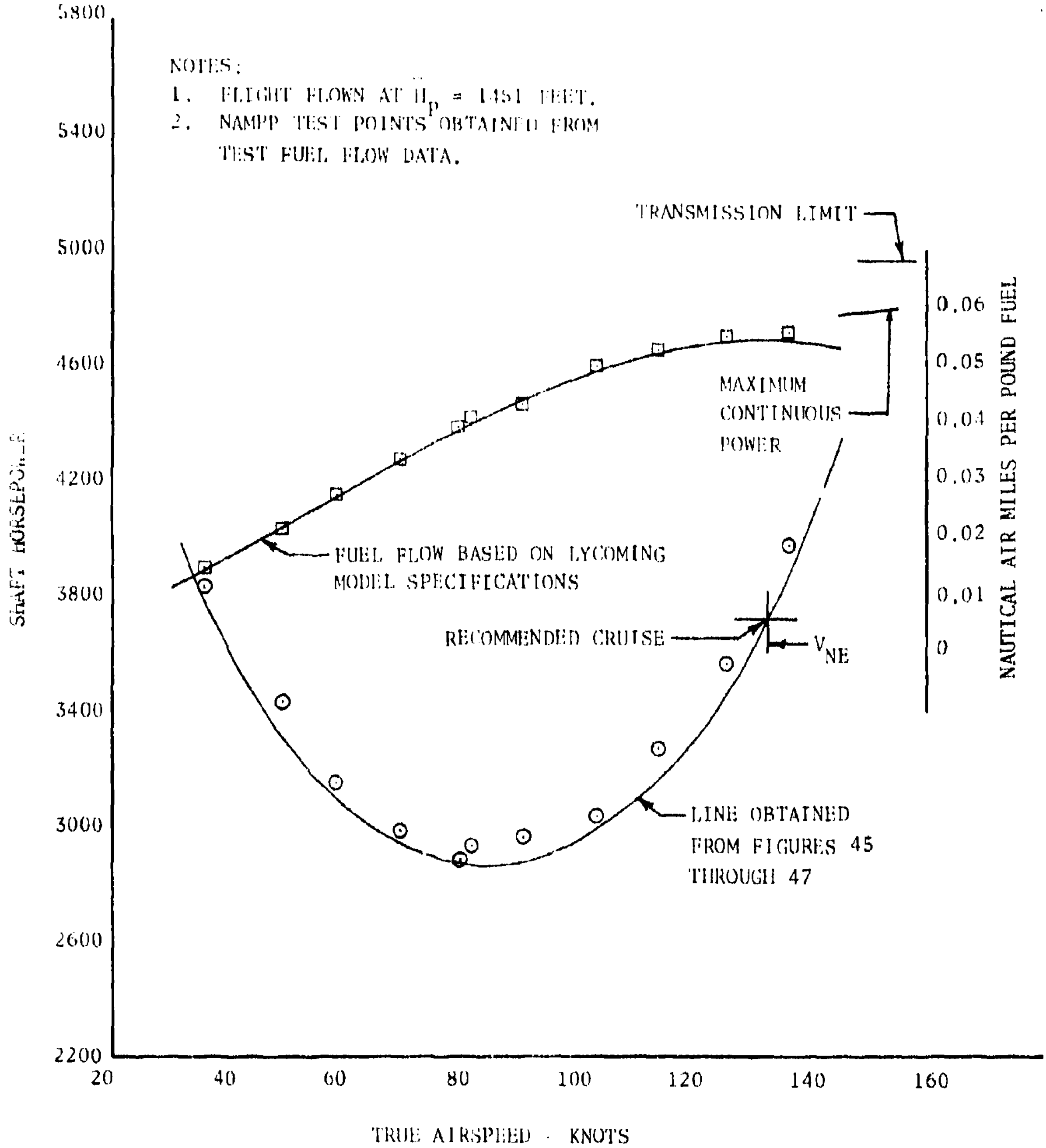


FIGURE NO. 22

LEVEL FLIGHT PERFORMANCE

CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
26660	232.9	330.6(MID)	0.004504	9.87

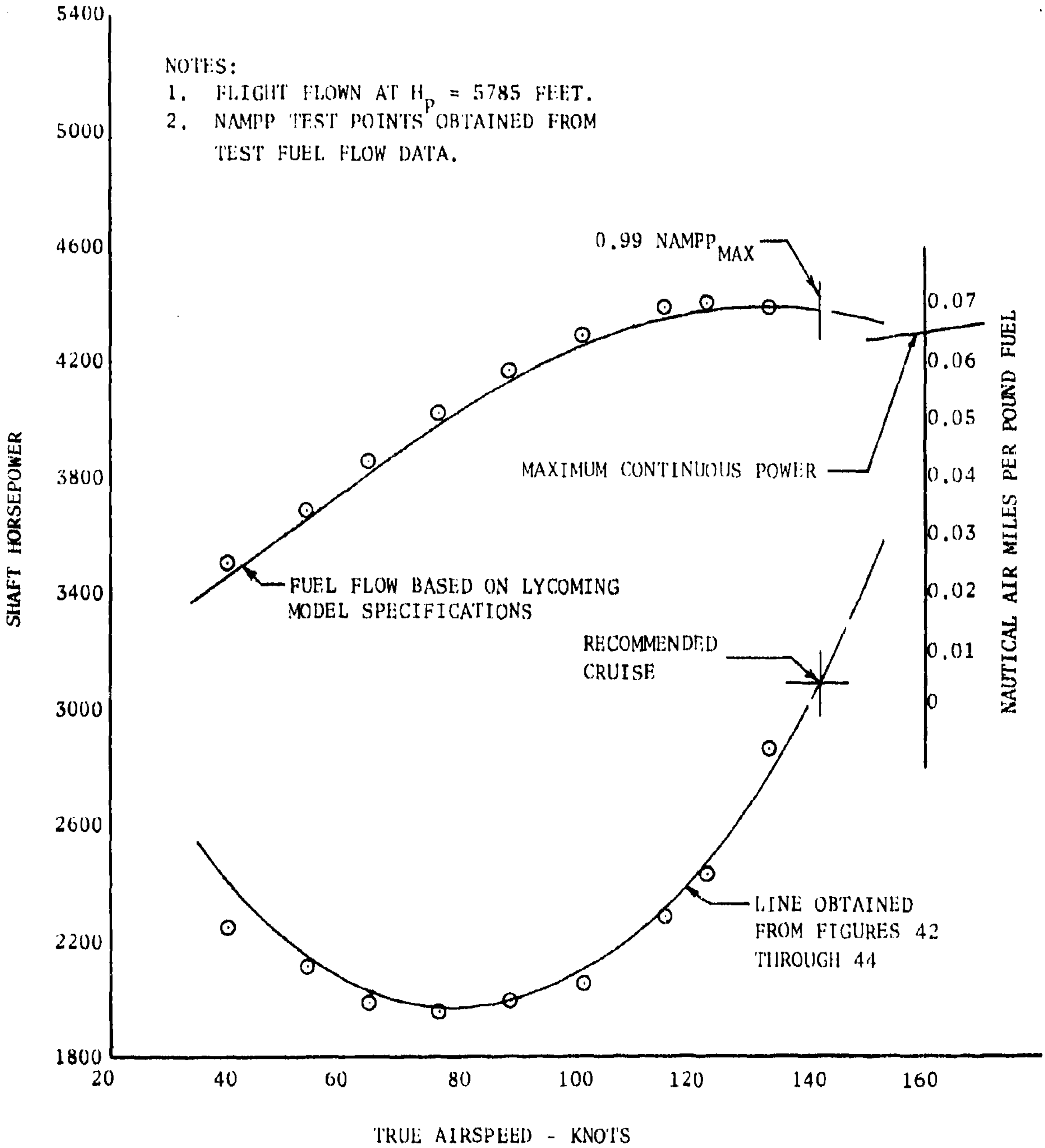


FIGURE NO. 23
LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
28070	227.4	347.2 (AFT)	0.004702	8.5

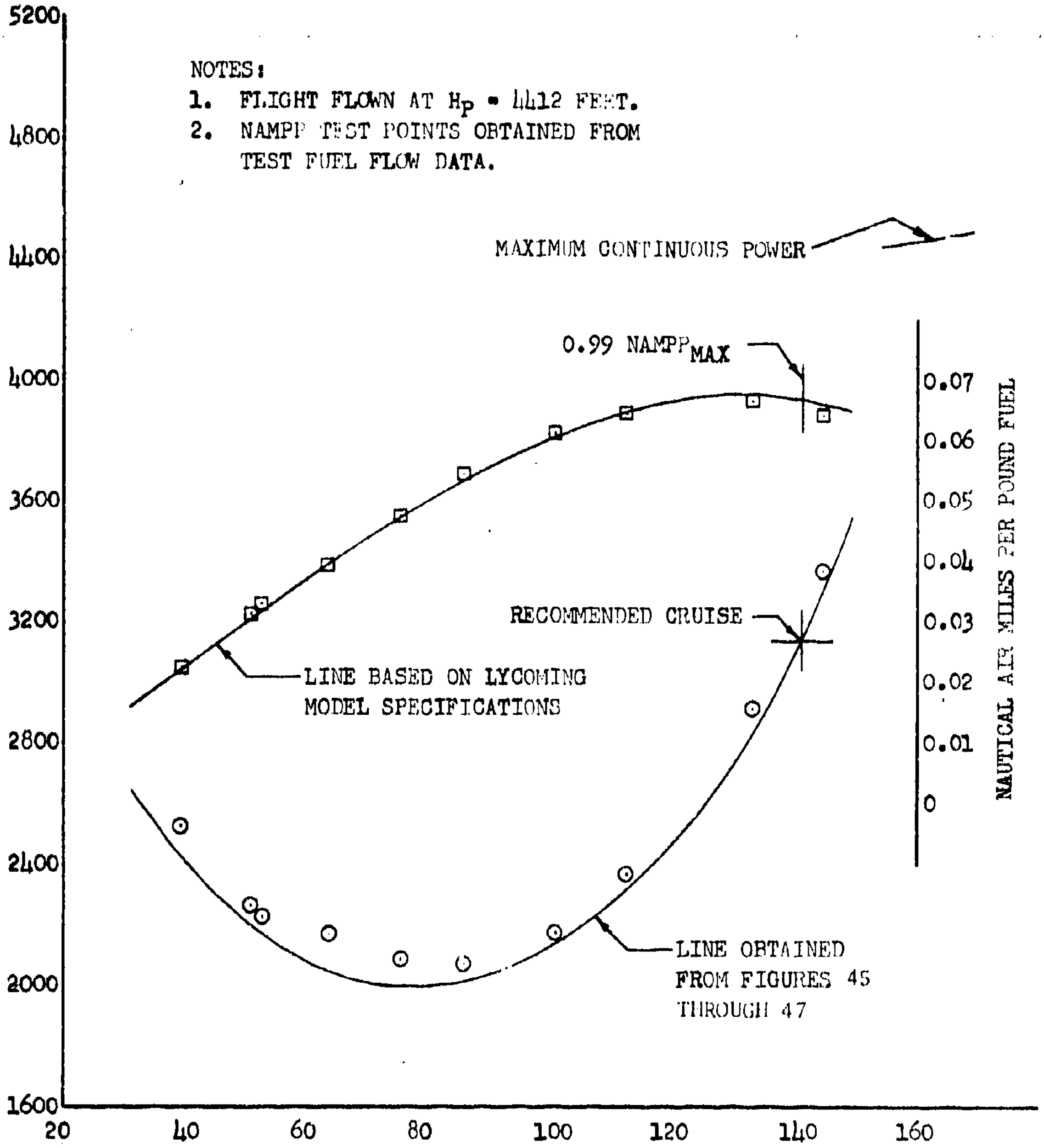


FIGURE NO. 24
LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
28650	226.2	330.1(MID)	0.004702	5.56

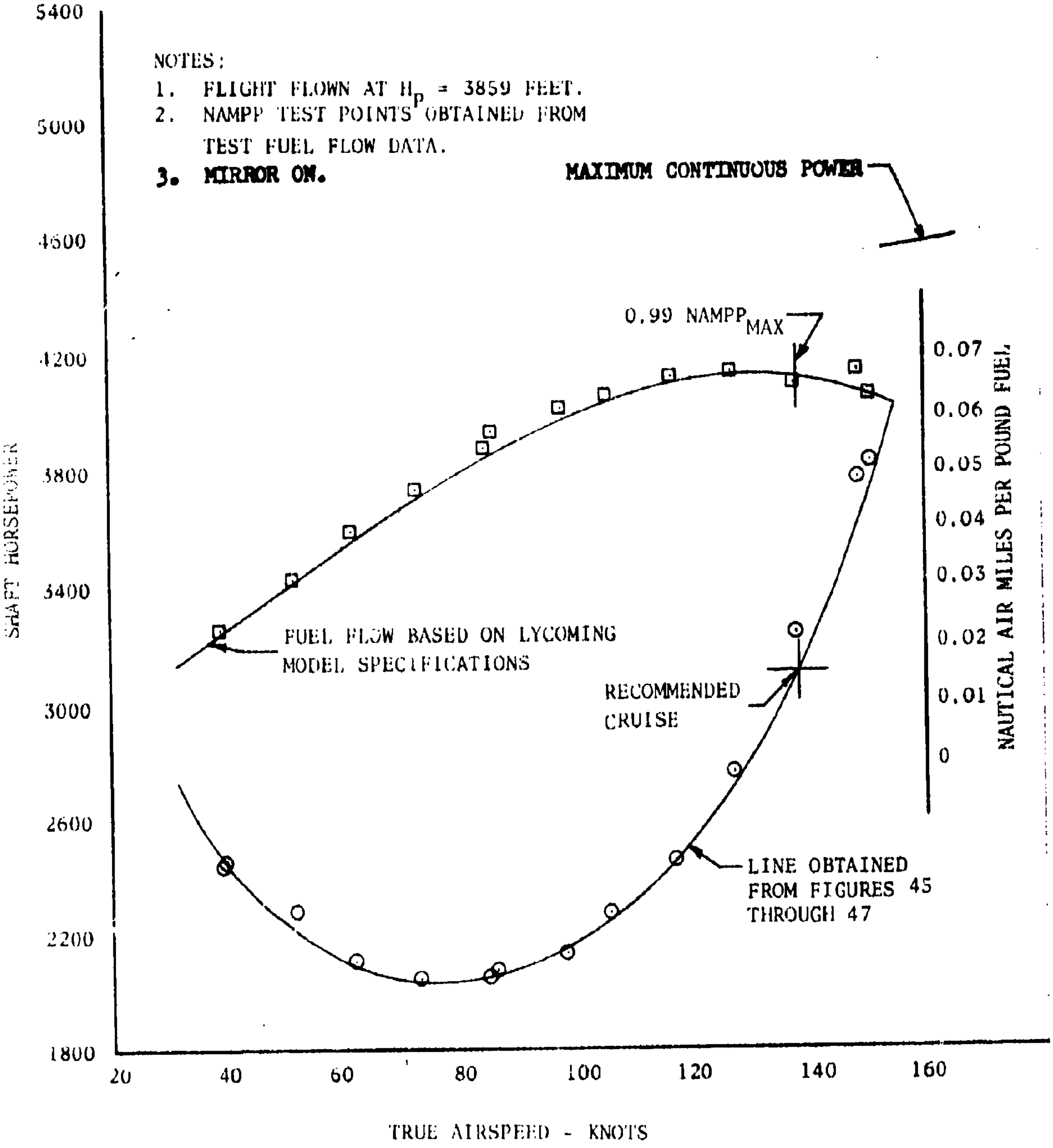


FIGURE NO. 25

LEVEL FLIGHT PERFORMANCE

CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
28670	225.9	330.5 (MID)	0.004702	4.82

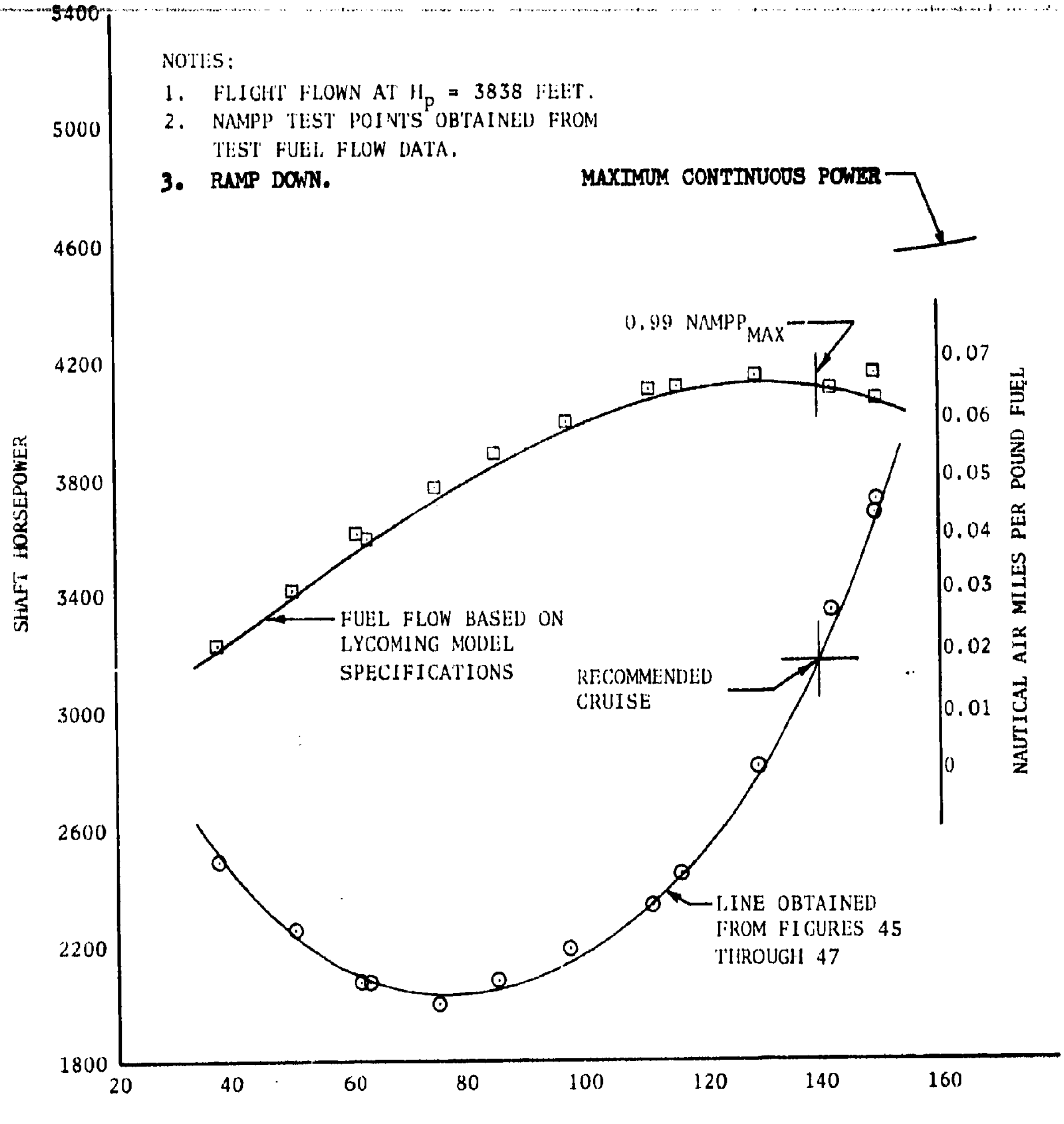


FIGURE NO. 26
LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
28750	228.5	311.2(FWD)	0.004702	11.25

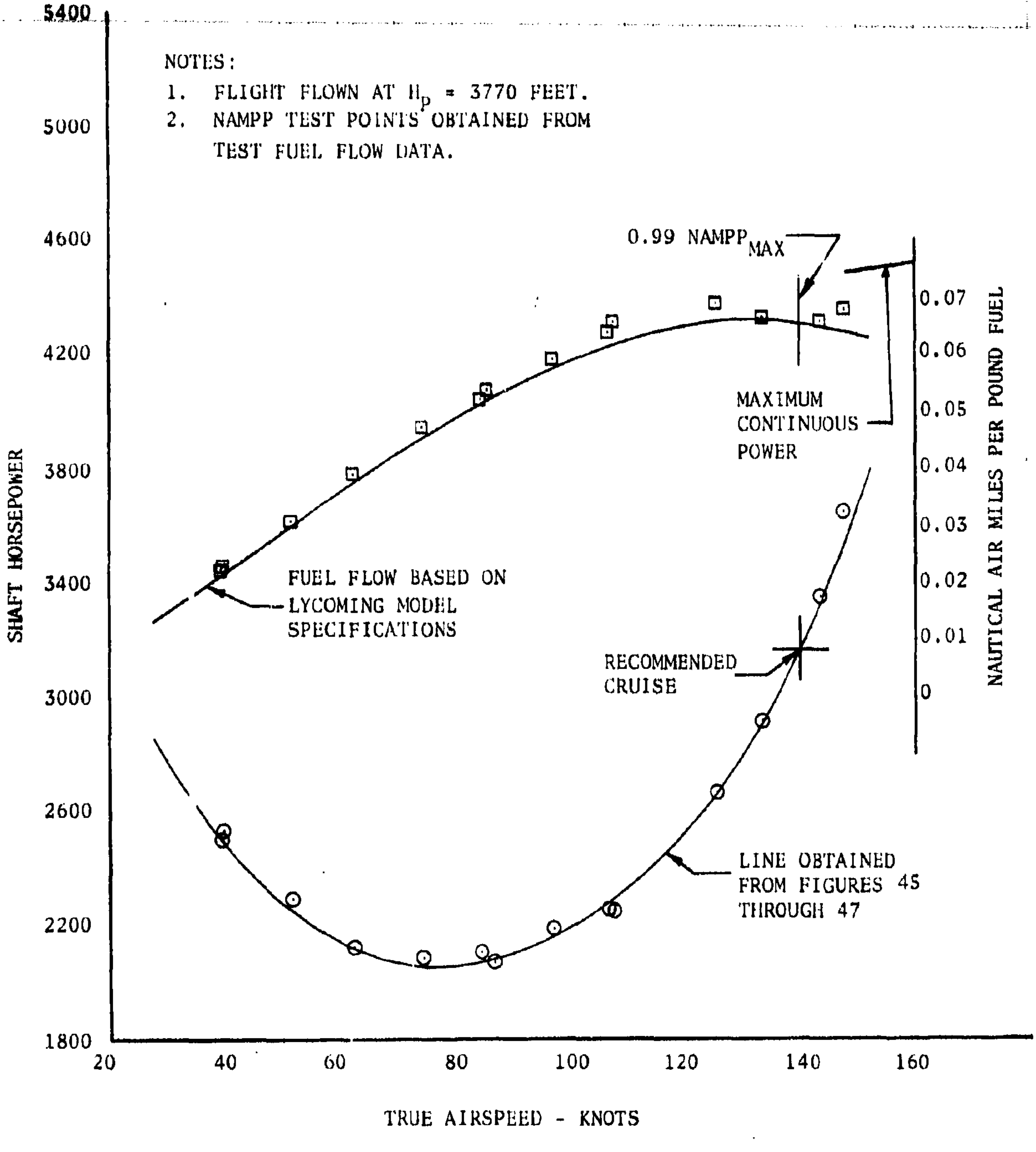


FIGURE NO. 27
LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
28830	226.5	330.2 (MID)	0.004702	6.30

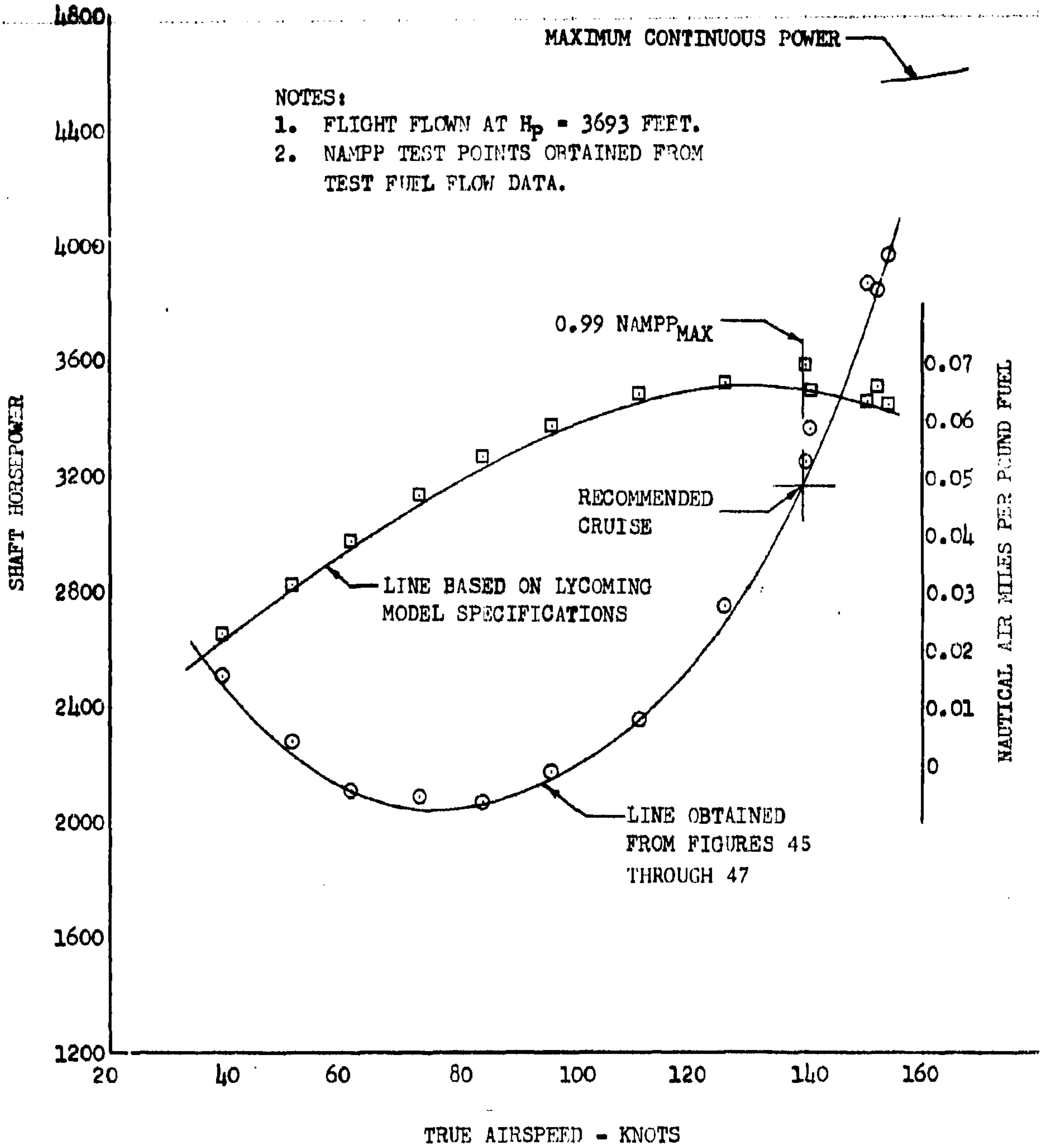


FIGURE NO. 28
LEVEL FLIGHT PERFORMANCE
CH-47B USA S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
30130	225.7	331.1 (MID)	0.005329	4.33

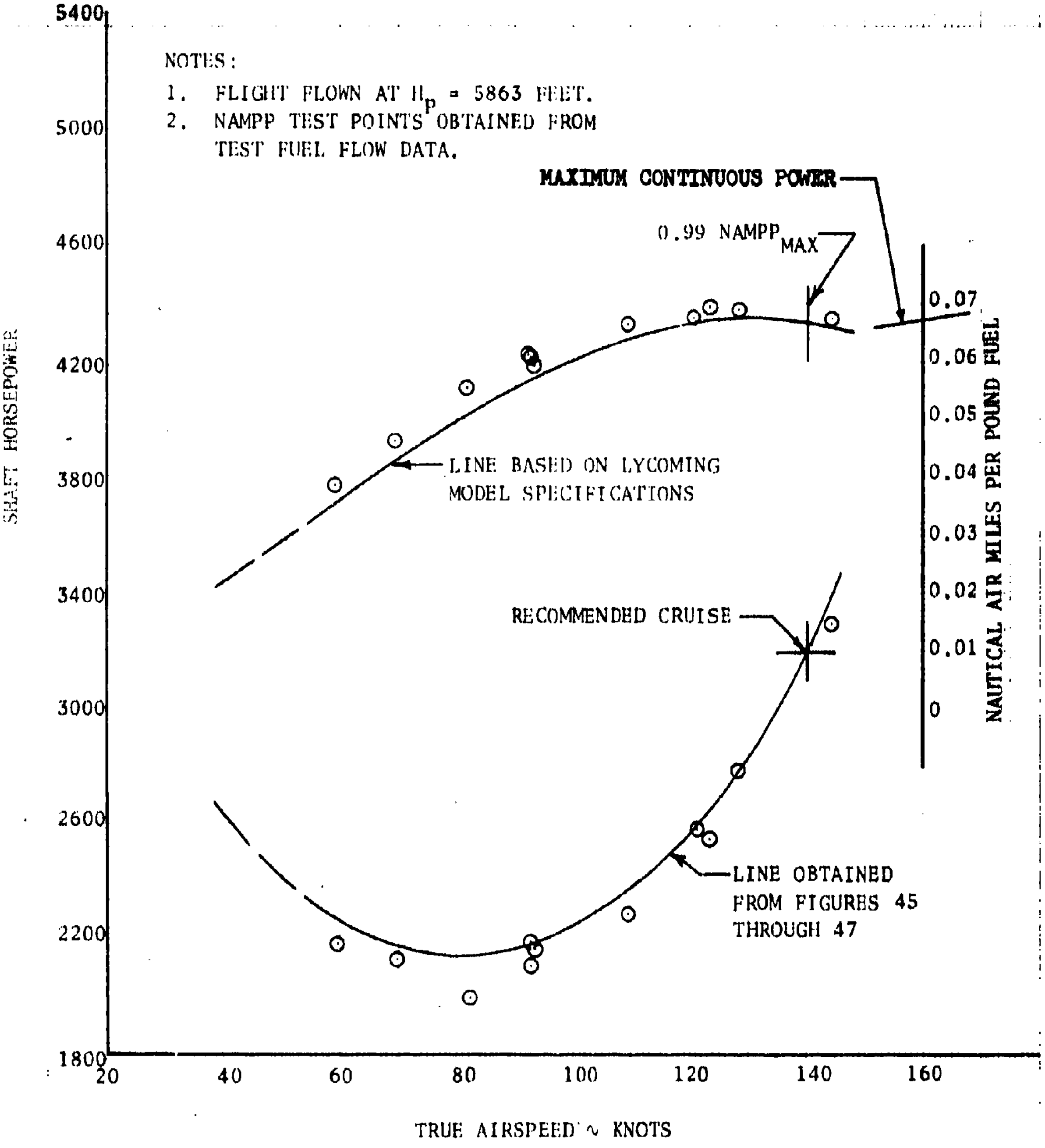


FIGURE NO. 29
LEVEL FLIGHT PERFORMANCE
CH-47B USA S/N 66-19100

GROSS WEIGHT LB	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG O.A.T. °C
30320	224.7	330.7(MID)	0.005329	1.87

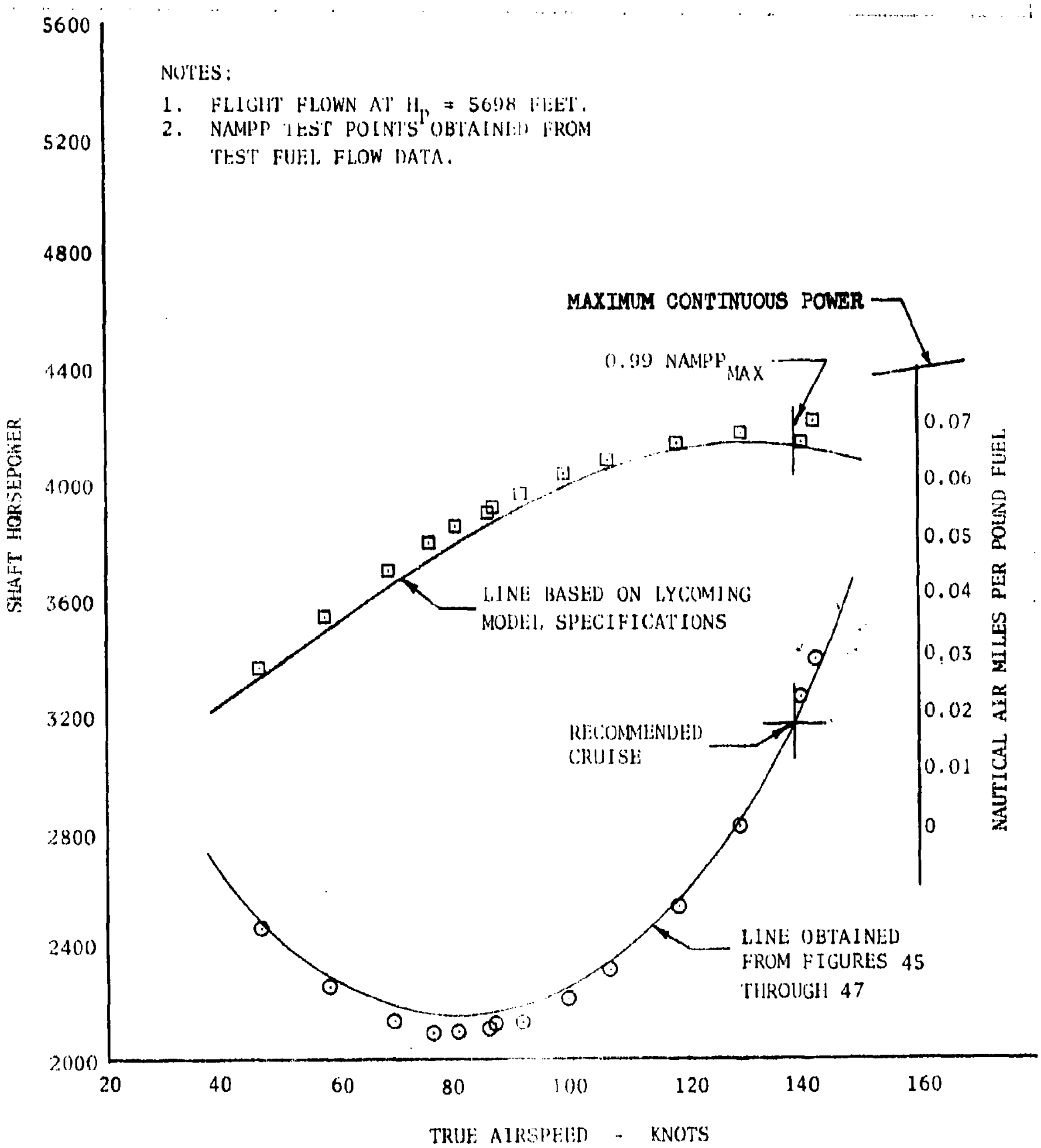


FIGURE NO. 30

LEVEL FLIGHT PERFORMANCE

CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
35200	223.1	330.2 (MID)	0.005509	10.15

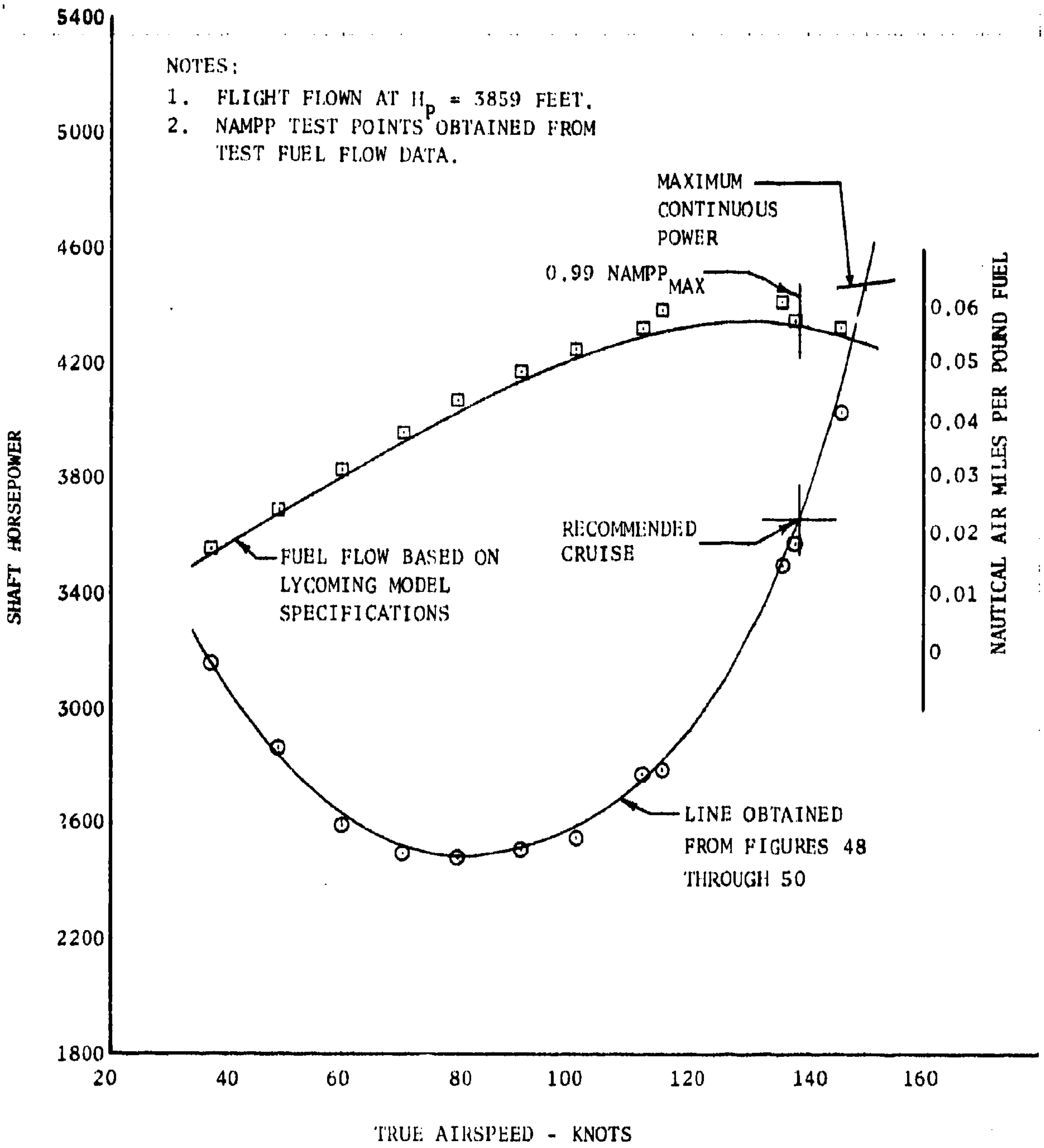


FIGURE NO. 31
LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
36280	225.0	331.9(MID)	0.006370	2.61

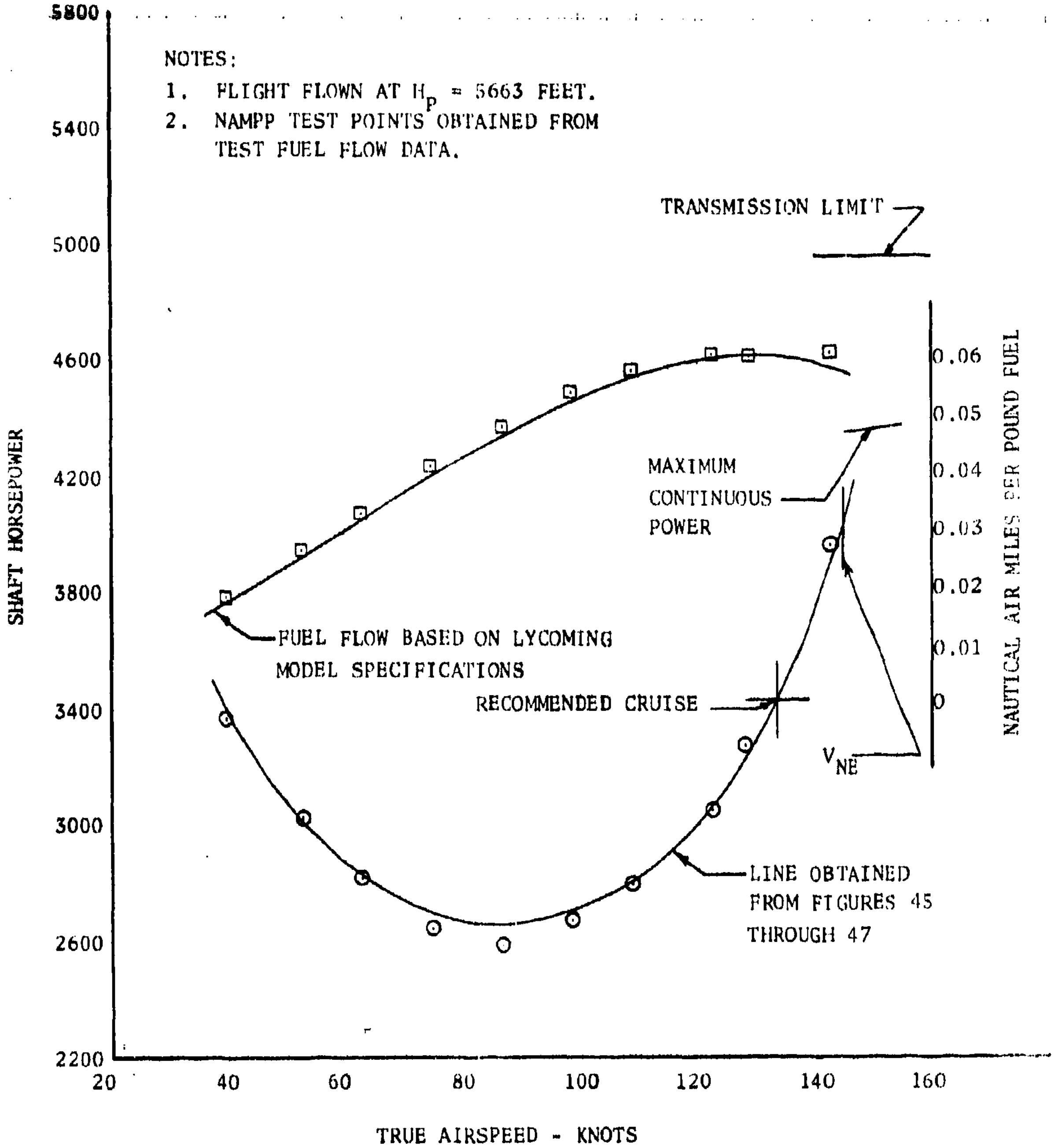


FIGURE NO. 32
LEVEL FLIGHT PERFORMANCE
CH-47B USA S/N 66-19100

GROSS WEIGHT LB	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
38540	229.1	330.2 (MID)	0.006511	0.71

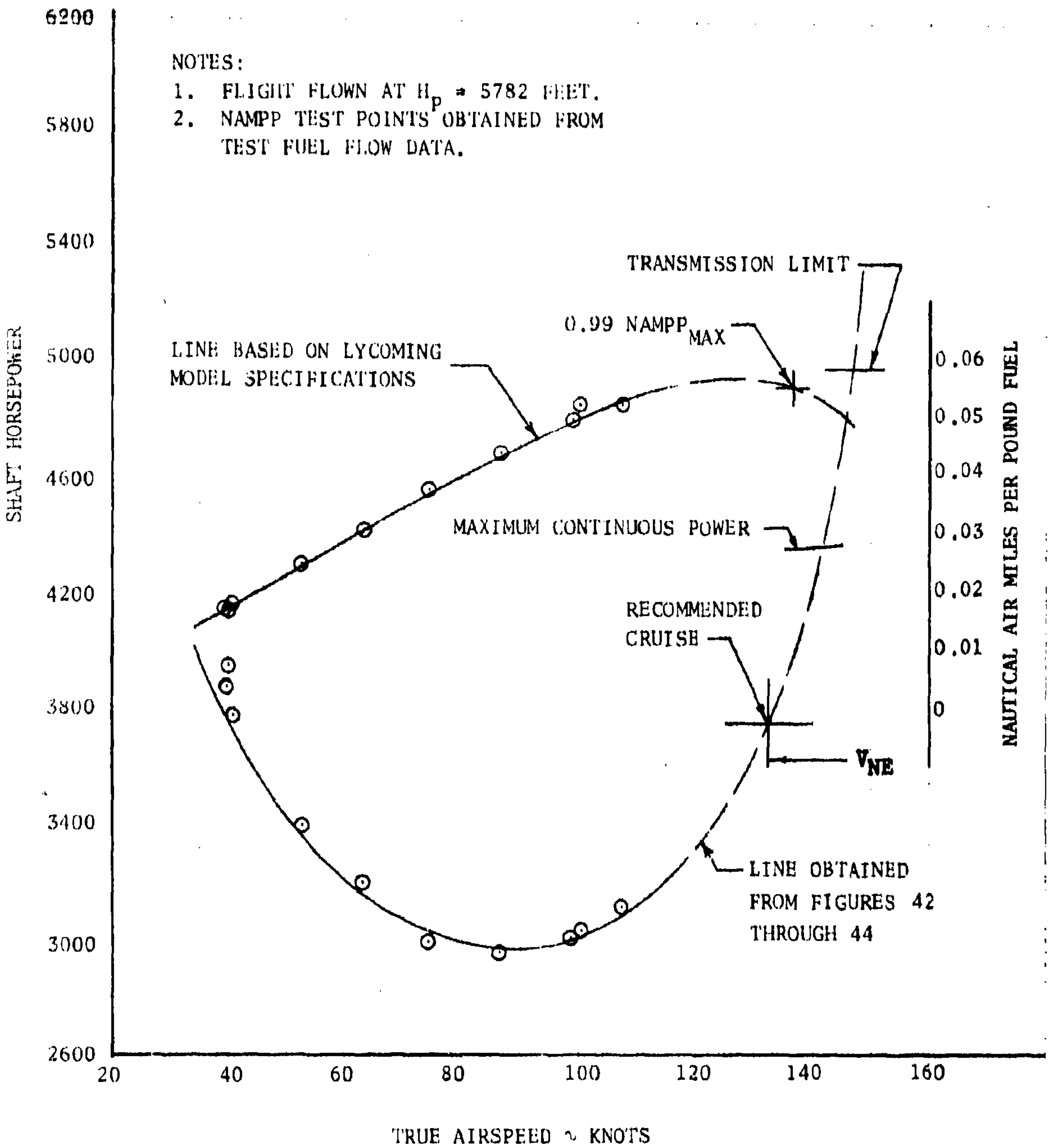


FIGURE NO. 33

LEVEL FLIGHT PERFORMANCE

CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
25830	229.5	330.9(MID)	0.005313	-9.66

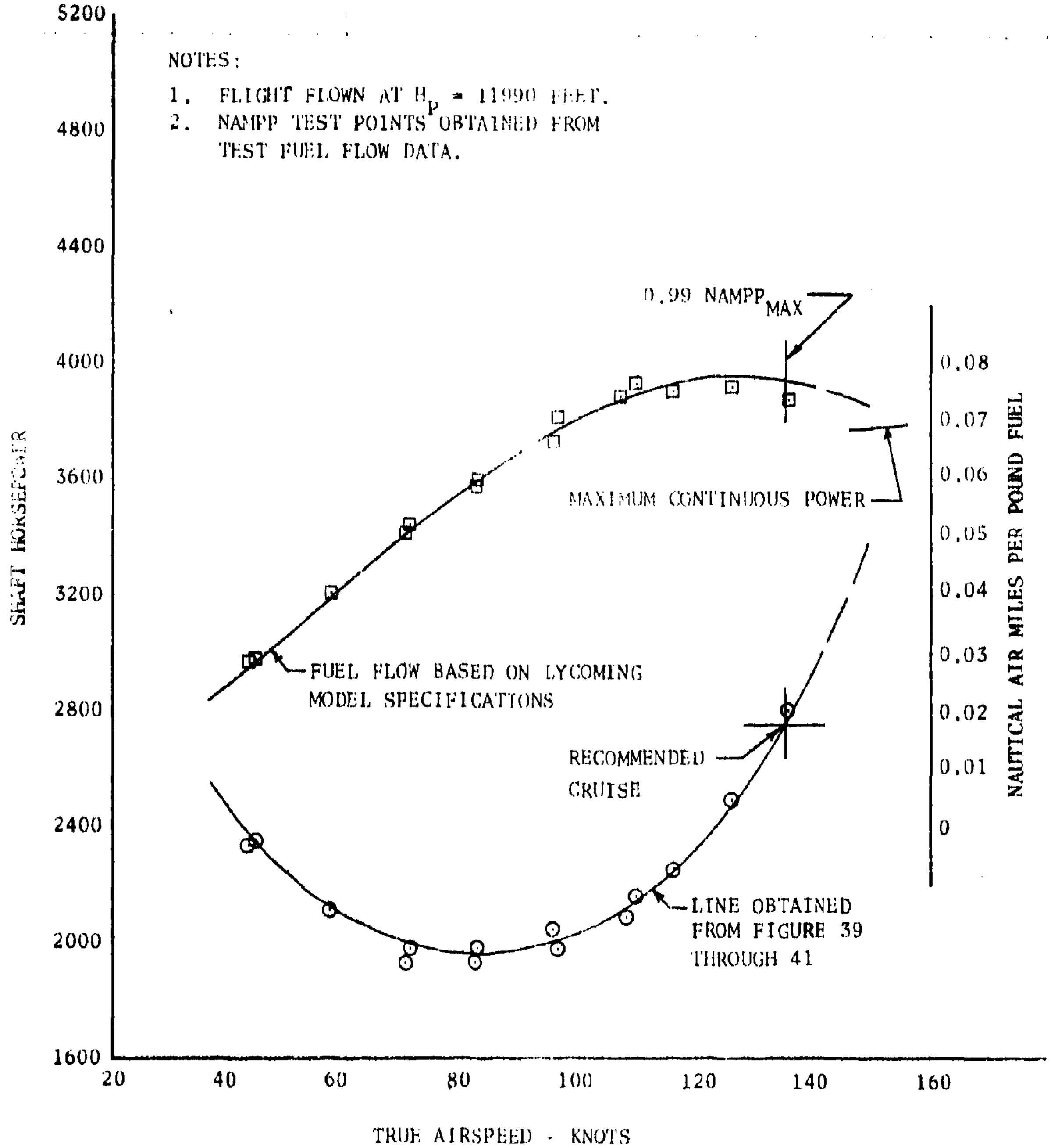


FIGURE NO. 34
LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
28580	229.3	330.5(MID)	0.005460	2.87

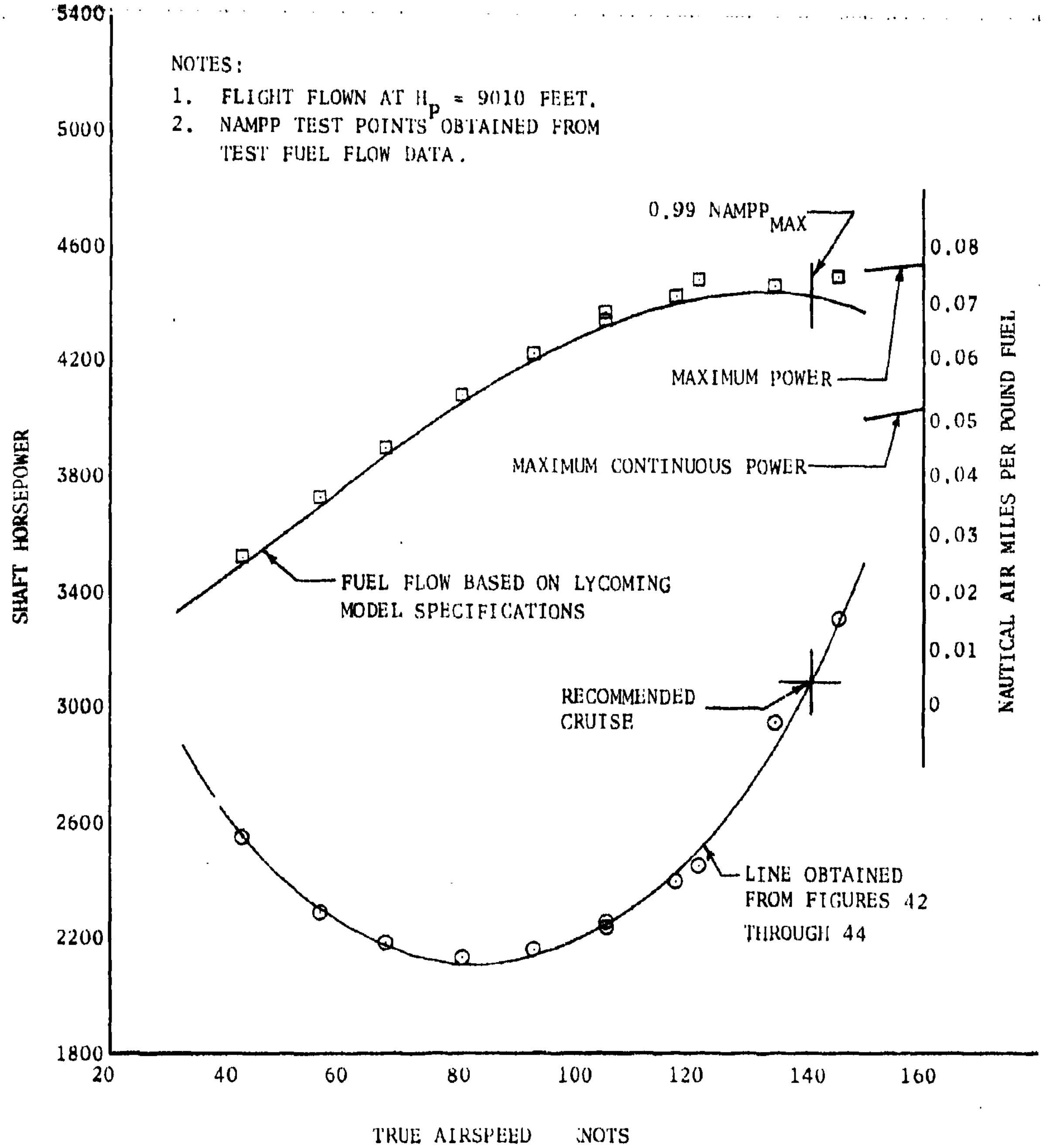


FIGURE NO. 38
LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
32090	233	330.5 (MID)	0.005889	-1.57

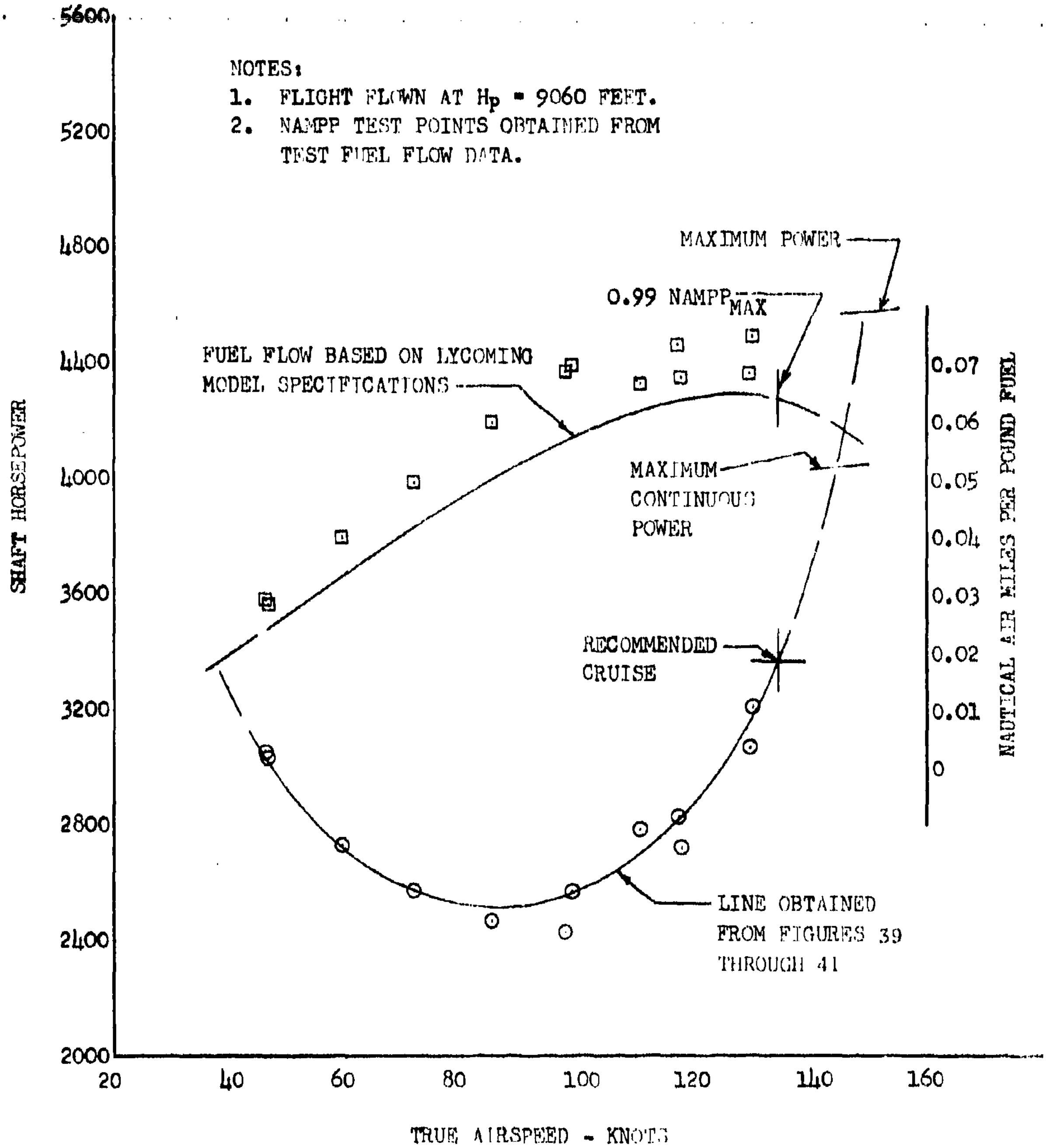


FIGURE NO. 36

LEVEL FLIGHT PERFORMANCE

CH-47B USA S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
31780	229.3	330.8 (MID)	0.006142	1.19

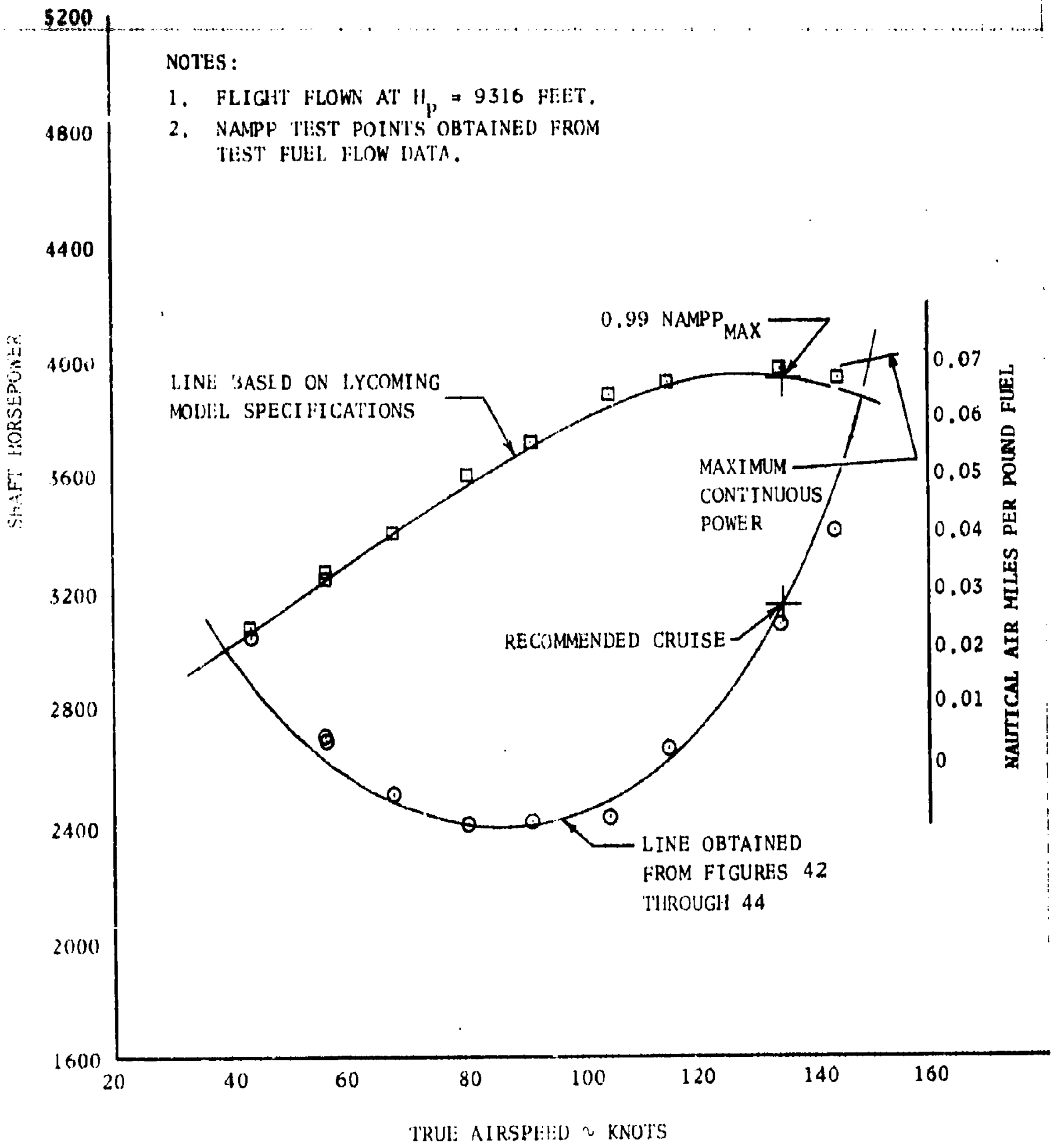


FIGURE NO. 37
LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
35800	230.3	330.8 (MID)	0.006825	3.59

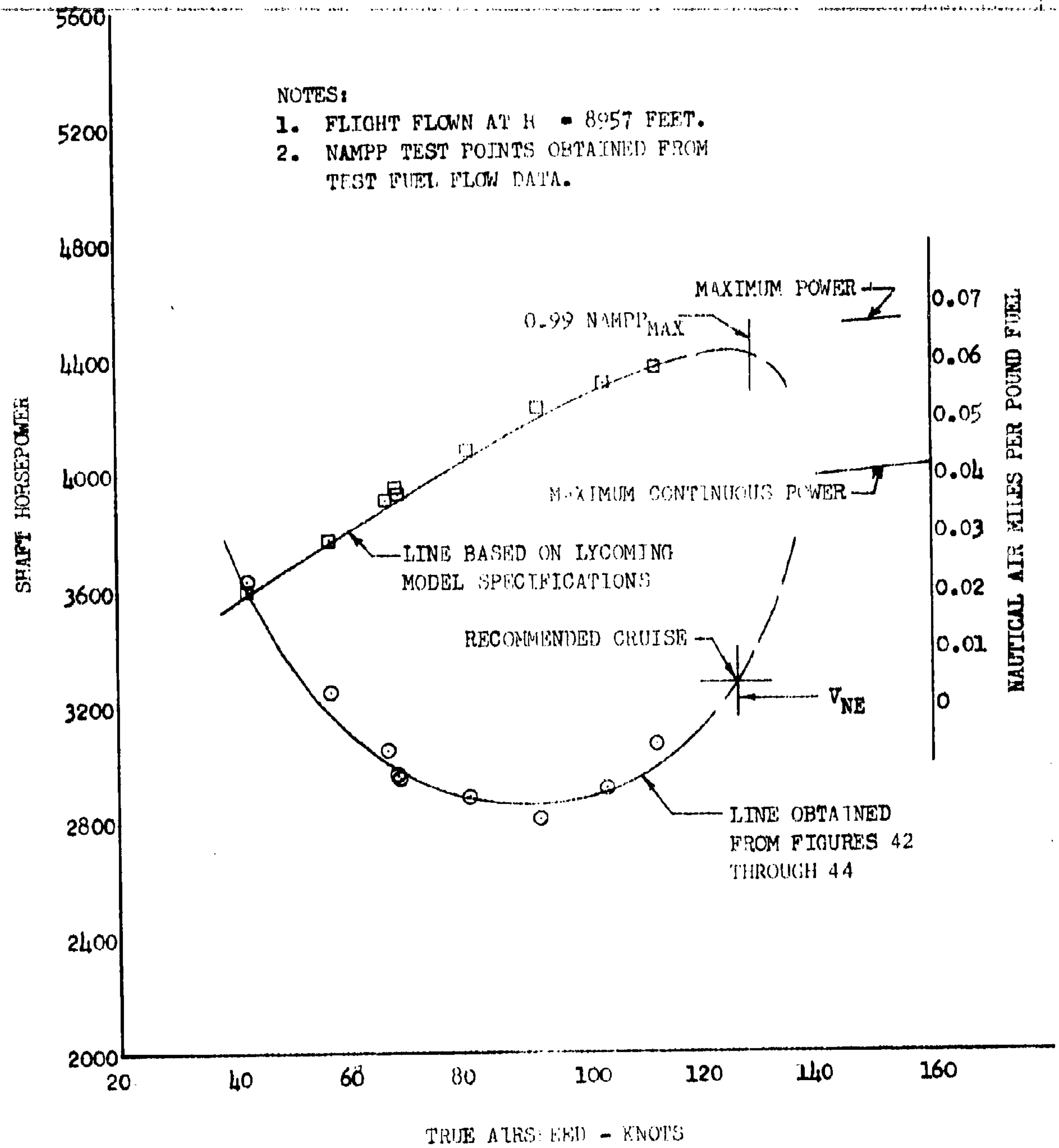


FIGURE NO. 38
LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

GROSS WEIGHT LB.	ROTOR SPEED R.P.M.	AVG. C.G. IN.	THRUST COEFFICIENT C_T	AVG. O.A.T. °C
30210	228.2	330.7 (MID)	0.006635	-12.64

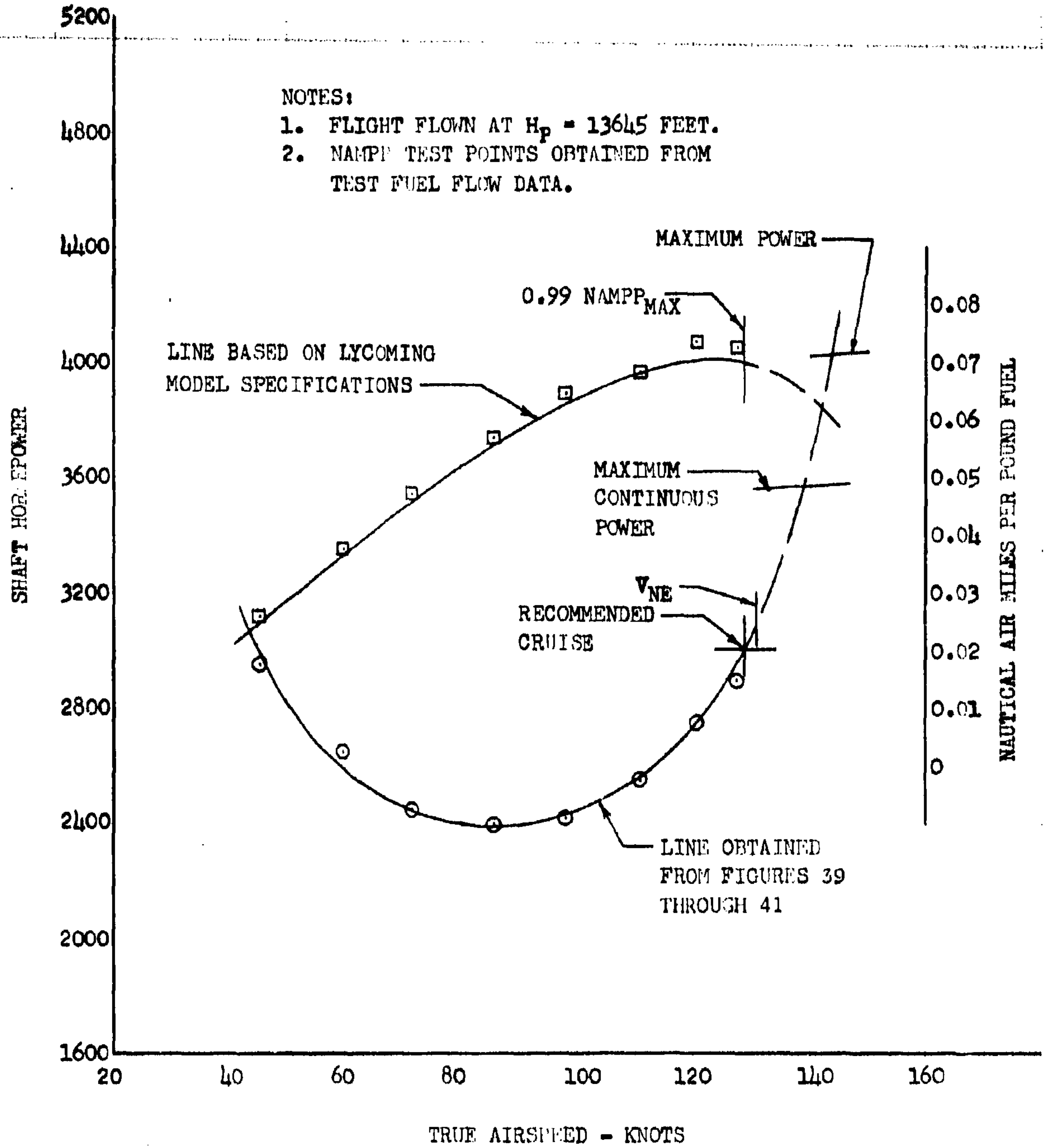


FIGURE NO. 39
REFERRED LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

$N/\sqrt{\theta} = 240$ R.P.M.

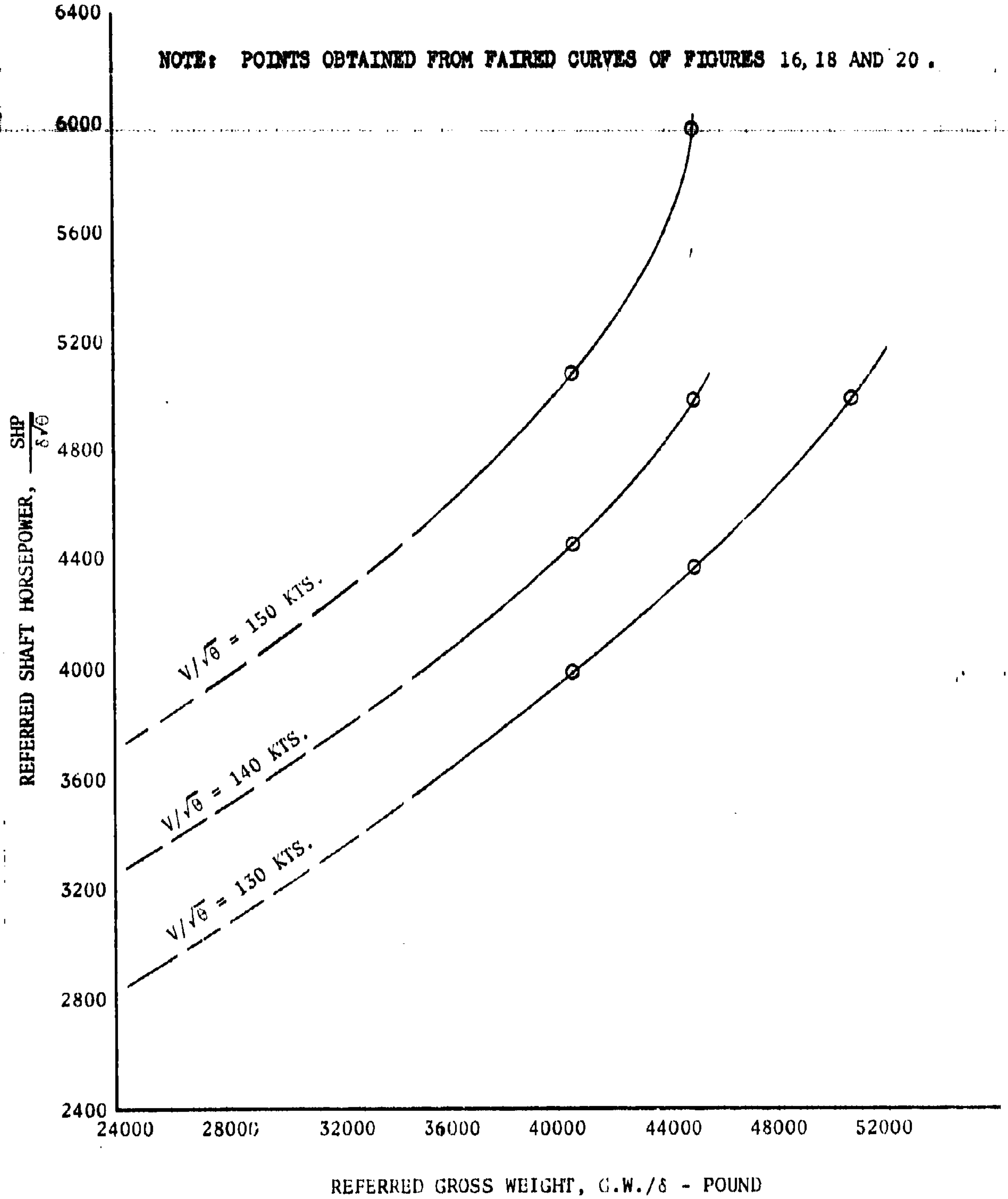


FIGURE NO. 40
REFERRED LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

$N/\sqrt{\Theta}$ = 240 R.P.M.

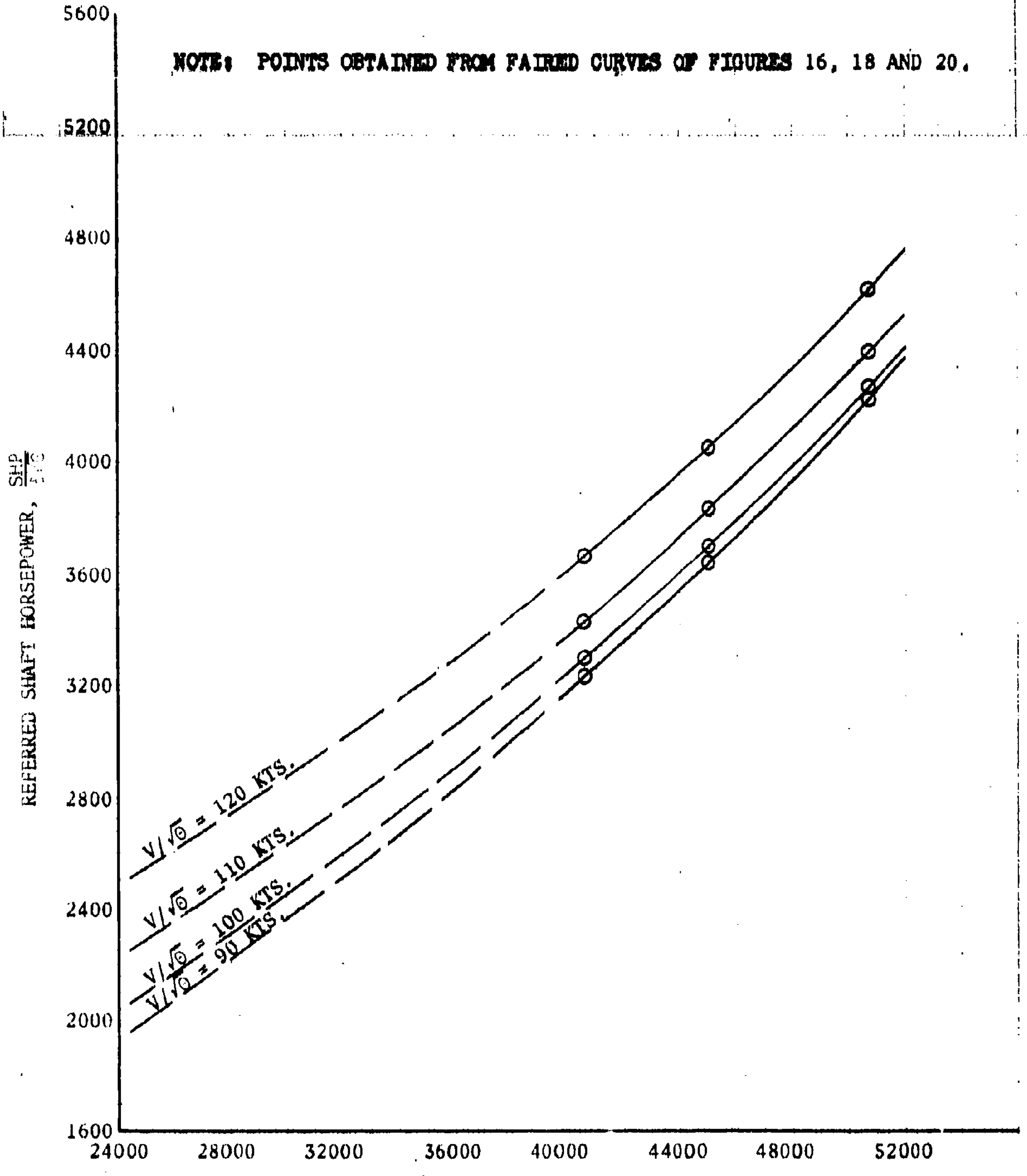


FIGURE NO. 41
REFERRED LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

$N/\sqrt{\theta}$ = 240 R.P.M.

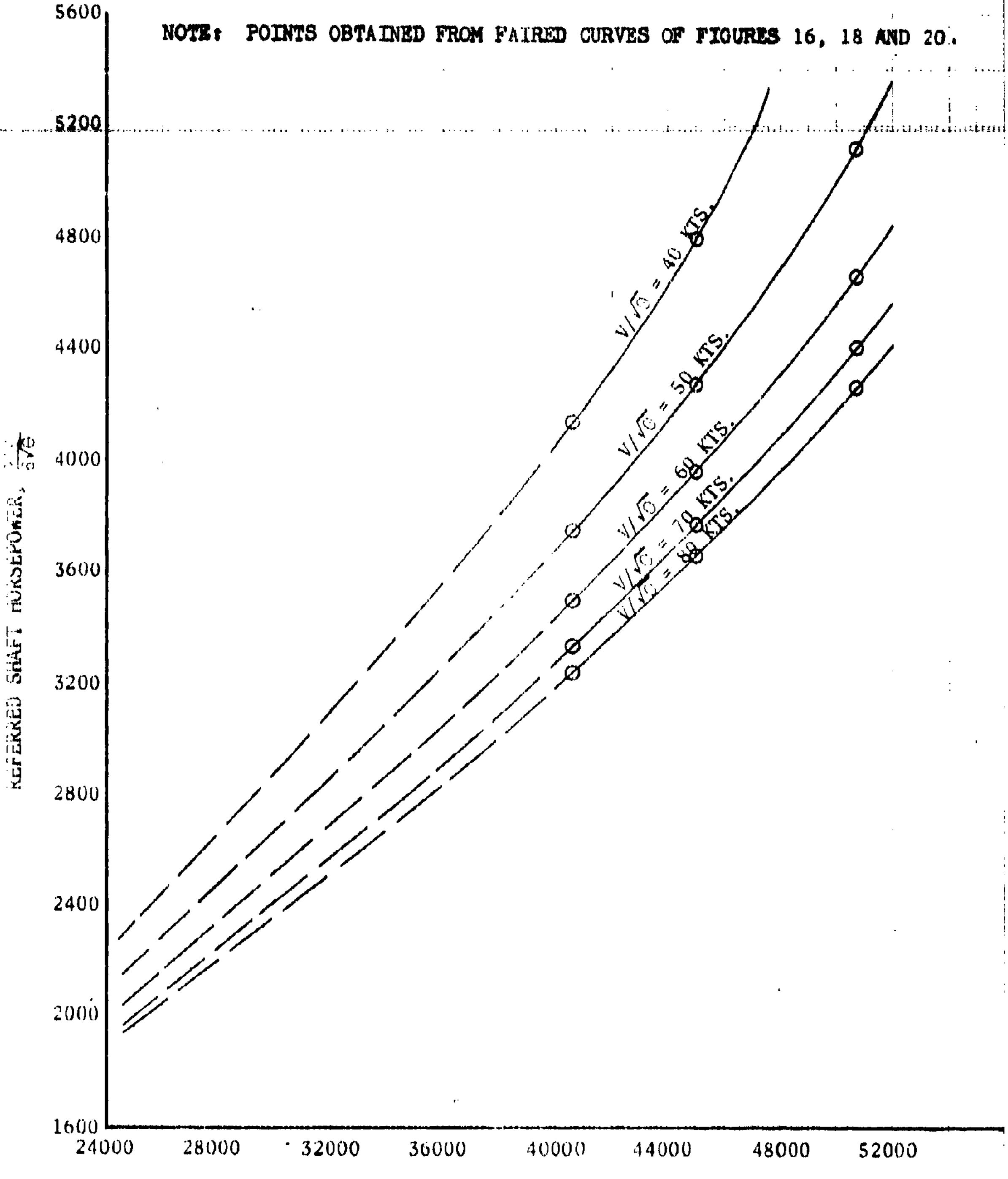


FIGURE NO. 42
REFERRED LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

$N/\sqrt{\Theta} = 235$ R.P.M.

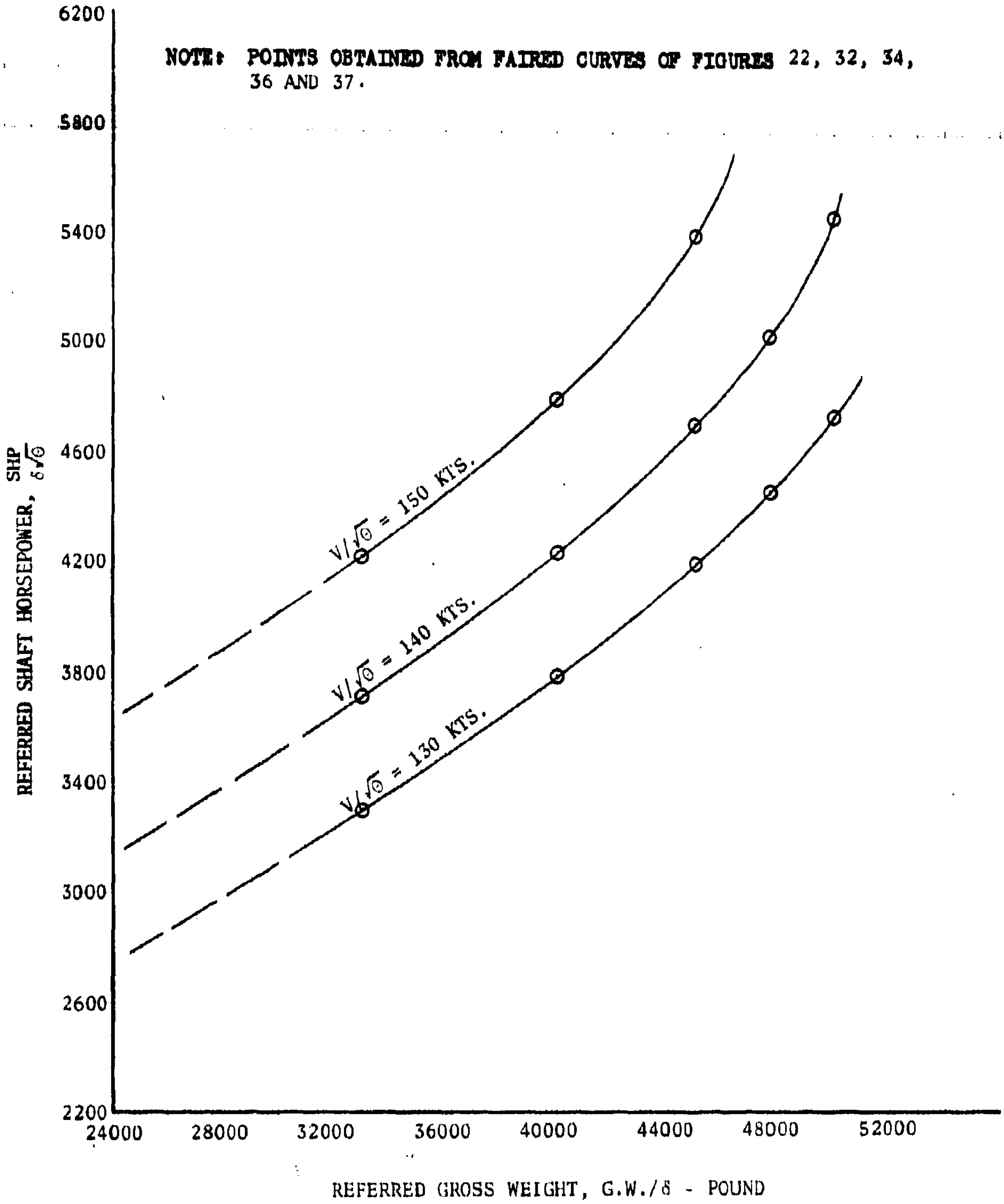


FIGURE NO. 43
REFERRED LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

$N/\sqrt{\theta}$ = 235 R.P.M.

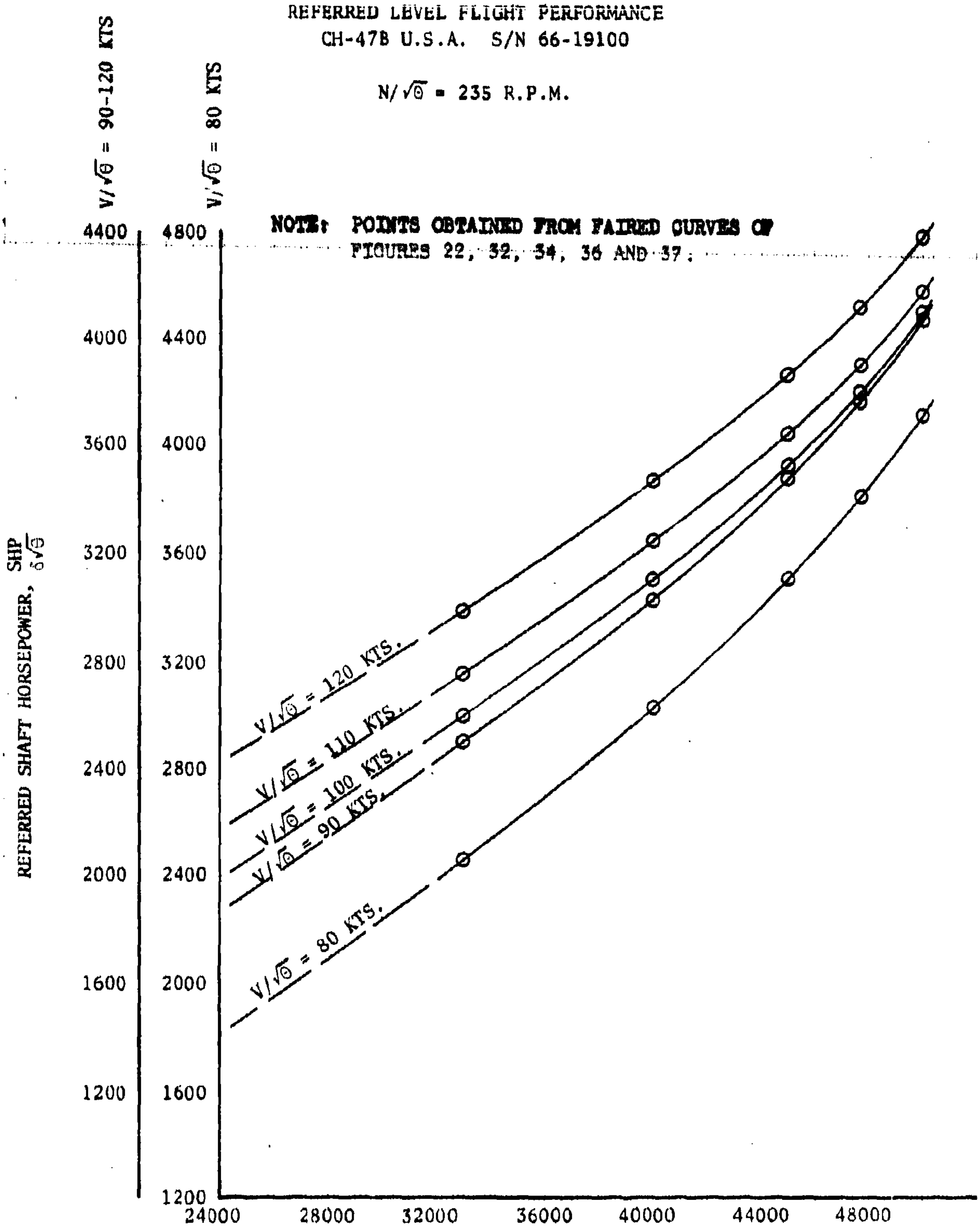


FIGURE NO. 44
REFERRED LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

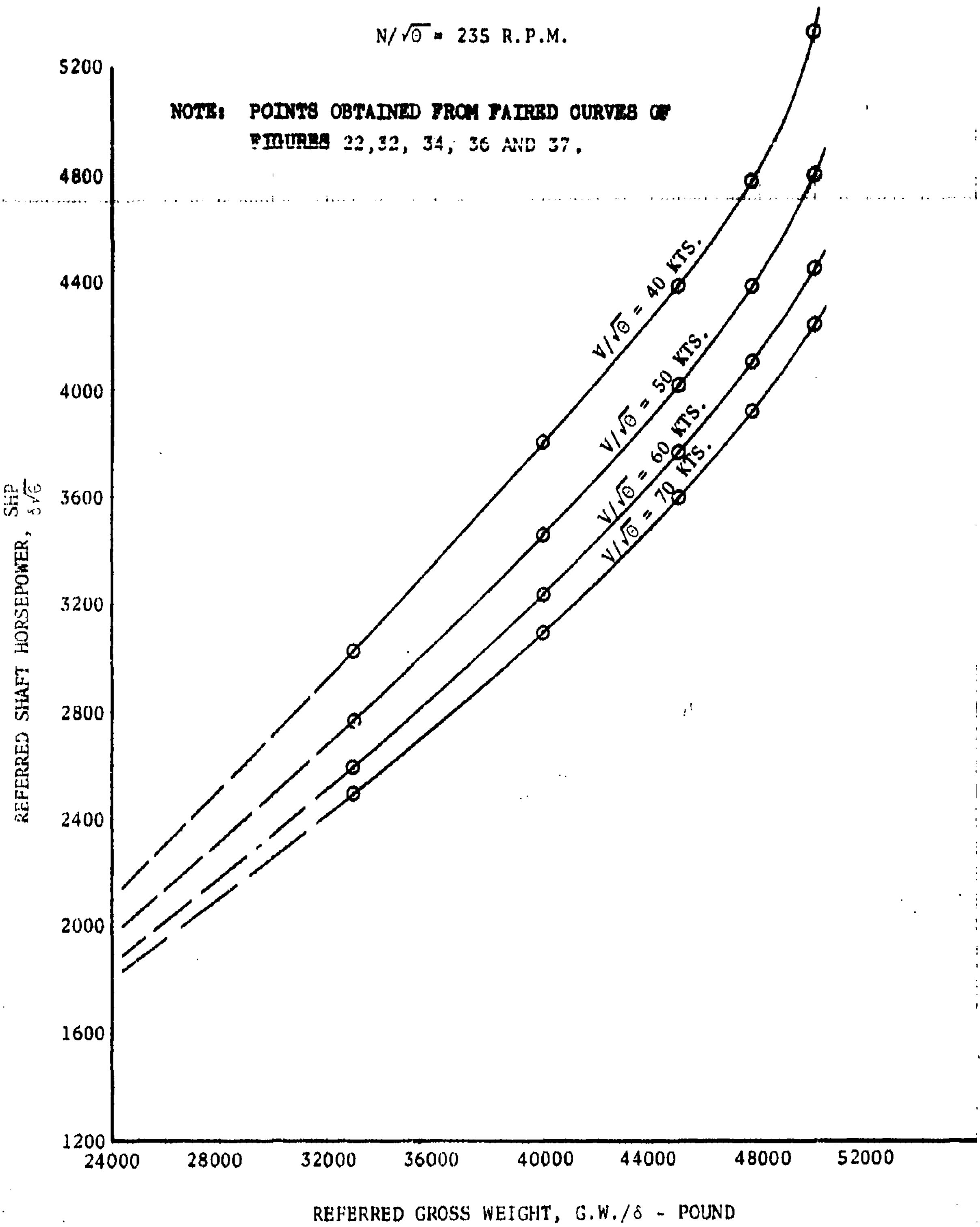


FIGURE NO. 45
REFERRED LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

$N/\sqrt{\theta} = 230$ R.P.M.

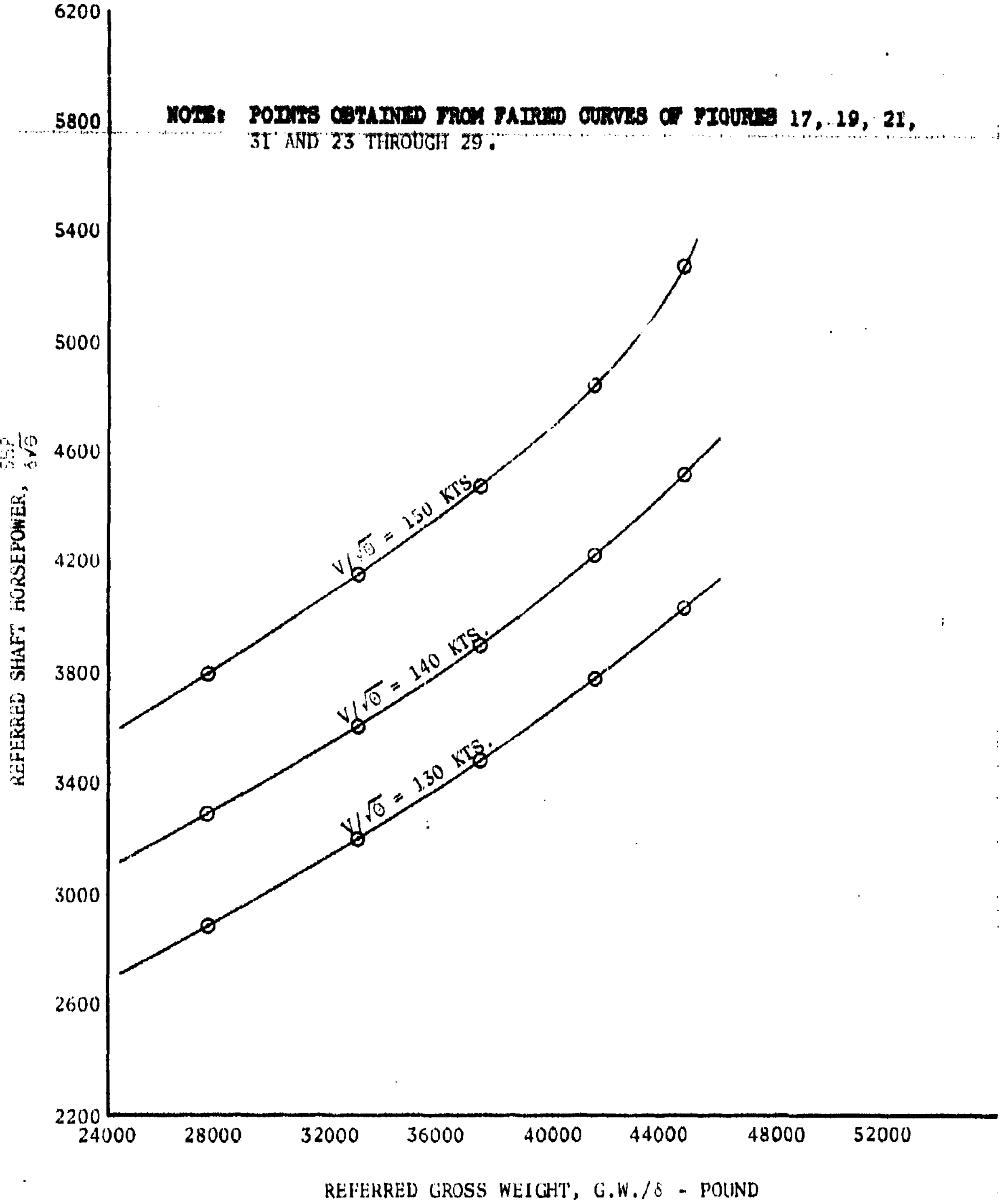


FIGURE NO. 46
REFERRED LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

$N/\sqrt{\theta}$ = 230 R.P.M.

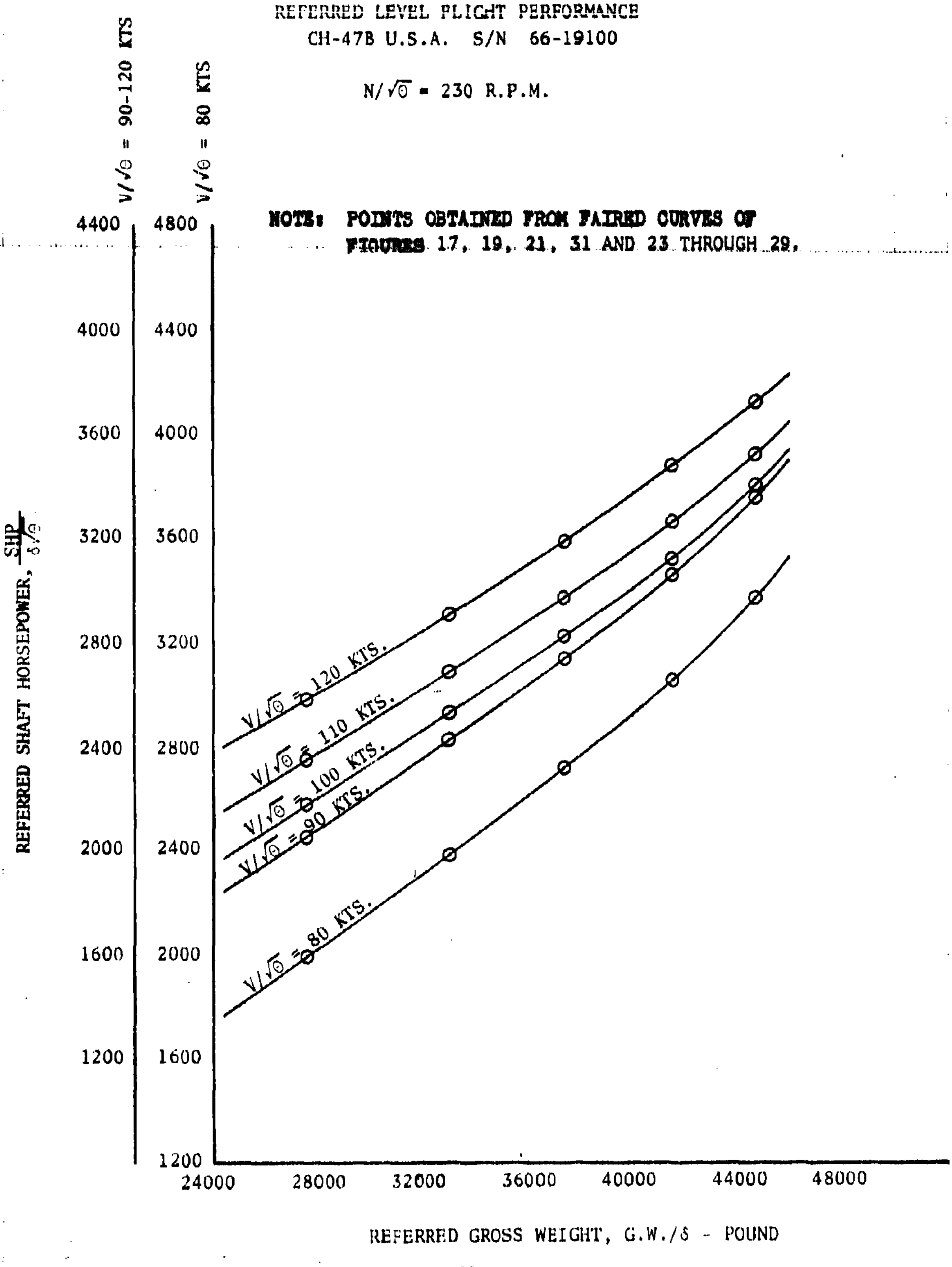


FIGURE NO. 47
REFERRED LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

$N/\sqrt{\theta}$ = 230 R.P.M.

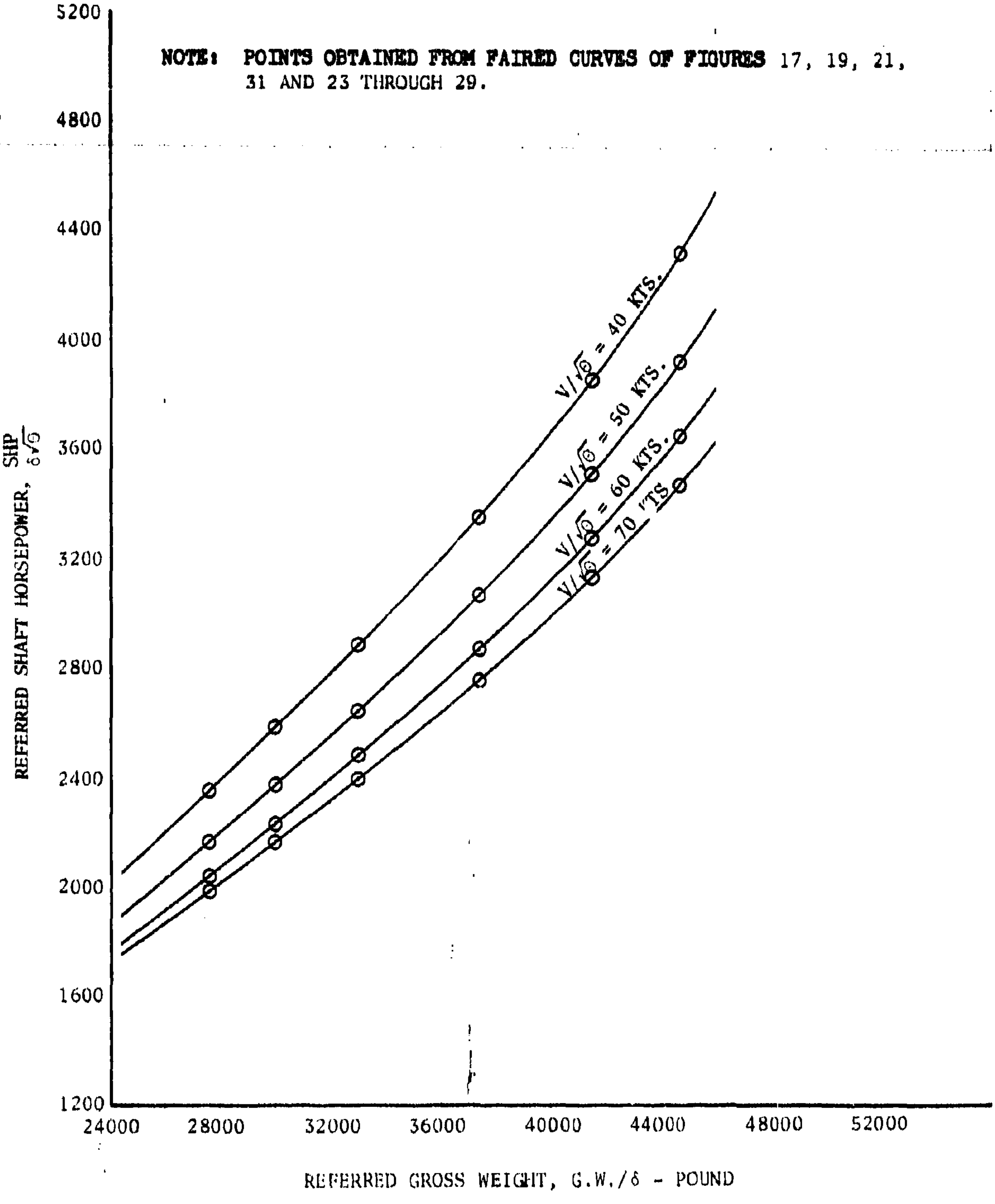


FIGURE NO. 48
REFERRED LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

$N/\sqrt{\theta} = 225$ R.P.M.

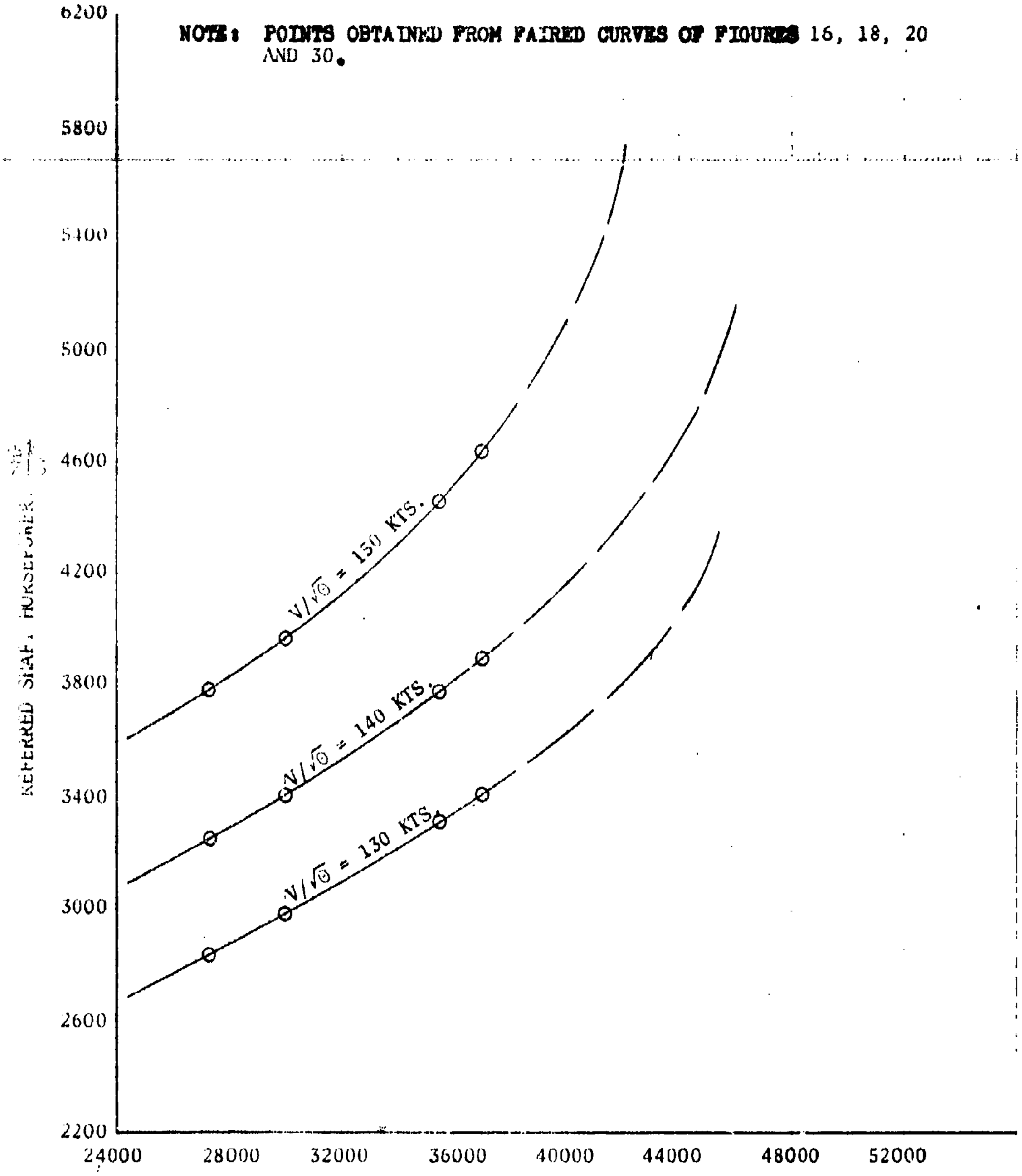


FIGURE NO. 49
REFERRED LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

$N/\sqrt{\theta}$ = 225 R.P.M.

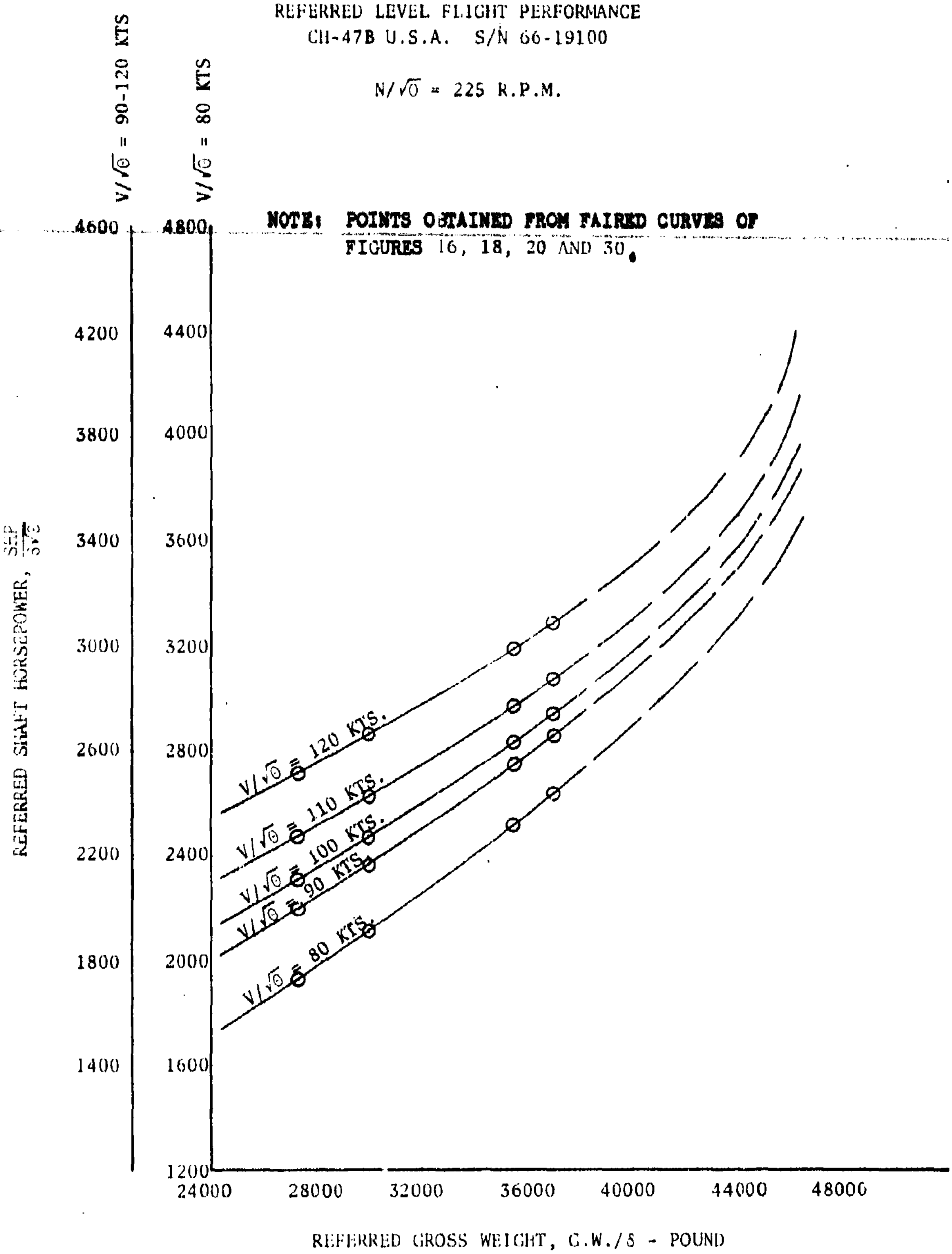


FIGURE NO. 50
REFERRED LEVEL FLIGHT PERFORMANCE
CH-47B U.S.A. S/N 66-19100

$N/\sqrt{\Theta}$ = 225 R.P.M.

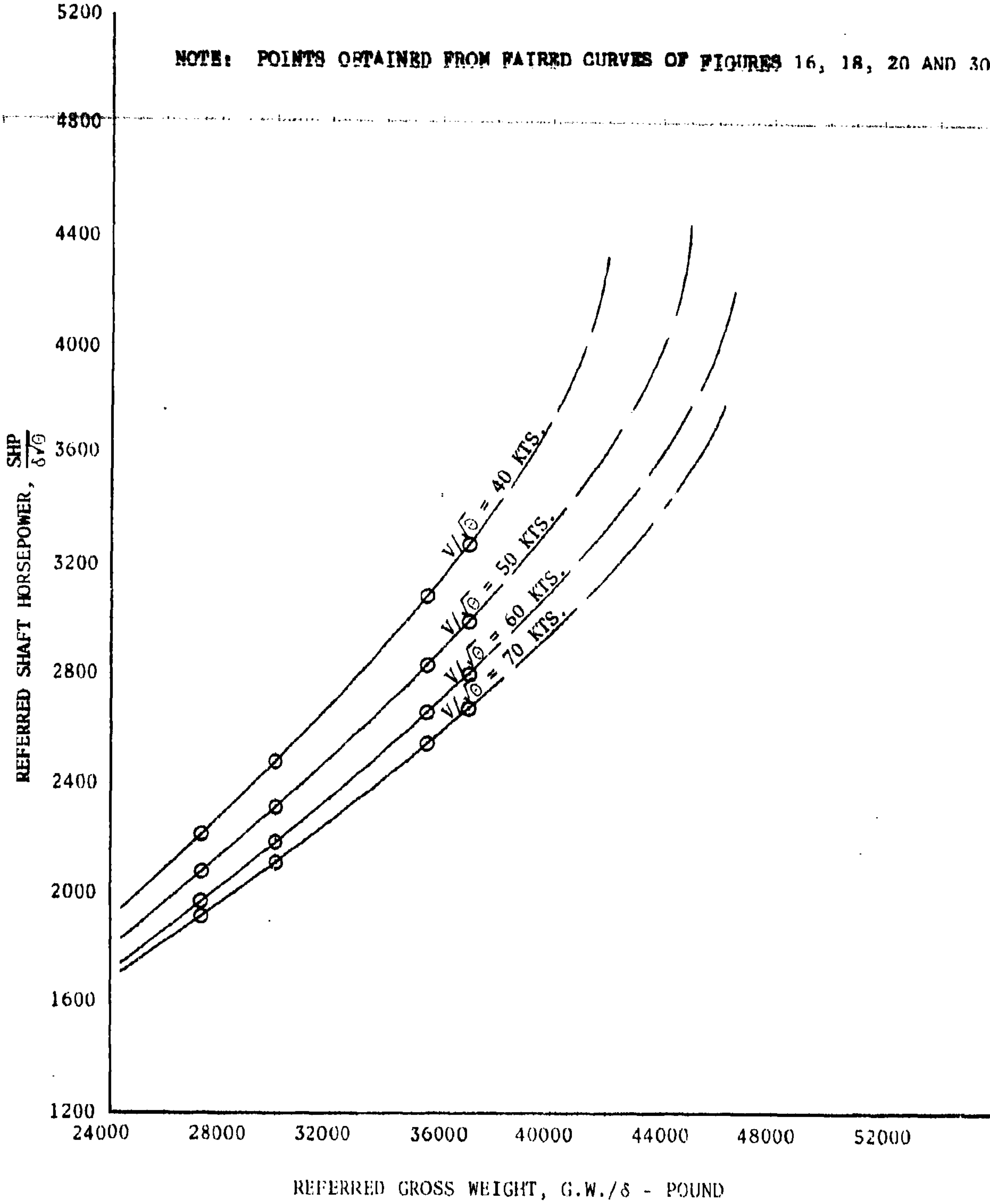


FIGURE NO. 51

RANGE SUMMARY

CH-47B U.S.A. S/N 66-19100

SEA LEVEL STANDARD DAY

ROTOR SPEED = 230 R.P.M.

NOTES:

1. BASED ON FIGURES 234, 243 AND 45 THROUGH 47.
2. MISSION PROFILE: CRUISE AIRSPEED AT 0.99 $NAMPP_{MAX}$, 2 MINUTE WARM UP AT NORMAL RATED POWER, INBOUND LOAD = ½ OUTBOUND LOAD, RETURN WITH 10% INITIAL FUEL REMAINING.
3. TAKE OFF GROSS WEIGHT CONSISTS OF EMPTY WEIGHT, FIXED USEFUL LOAD, INITIAL FUEL, AND OUTBOUND LOAD.

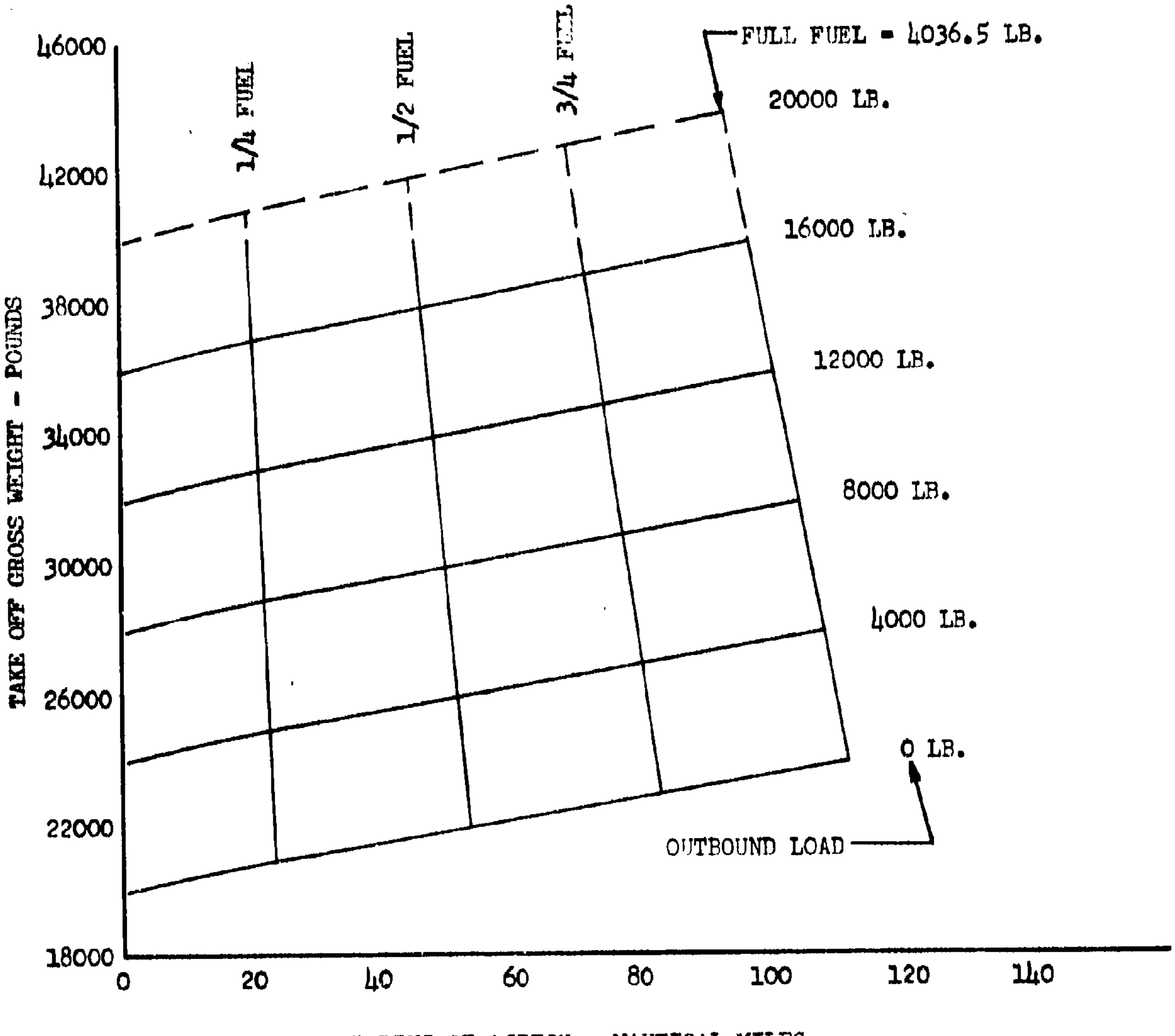
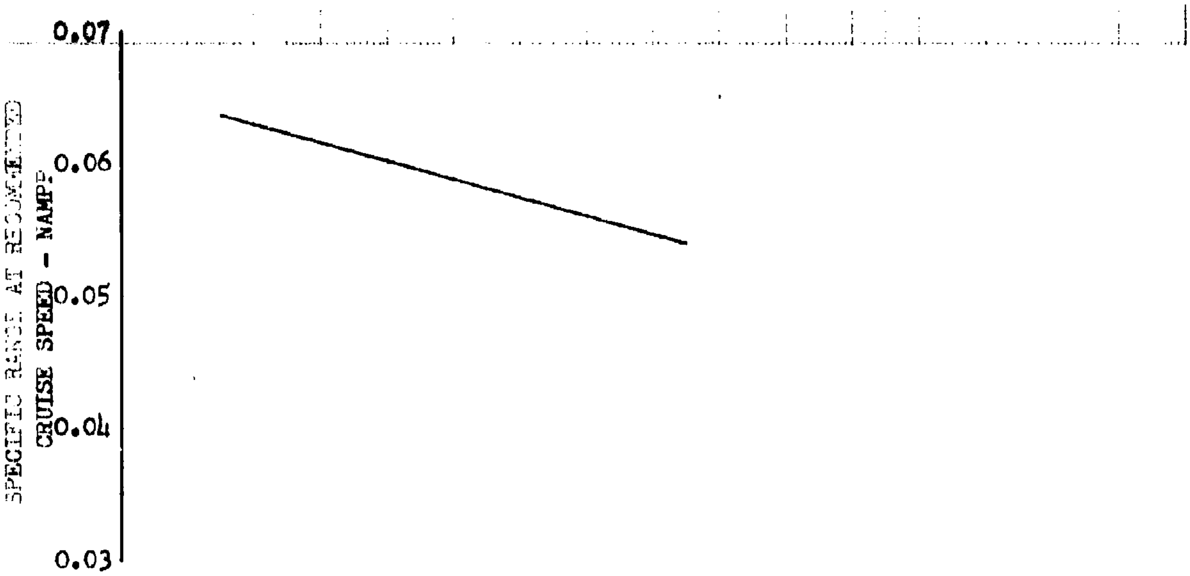


FIGURE NO. 52
LEVEL FLIGHT RANGE SUMMARY
CH-47B U.S.A. S/N 66-19100

SEA LEVEL
STANDARD DAY
ROTOR SPEED = 225 R.P.M.



NOTE: LINES OBTAINED FROM FIGURES 233, 242 AND 48 THROUGH 50.

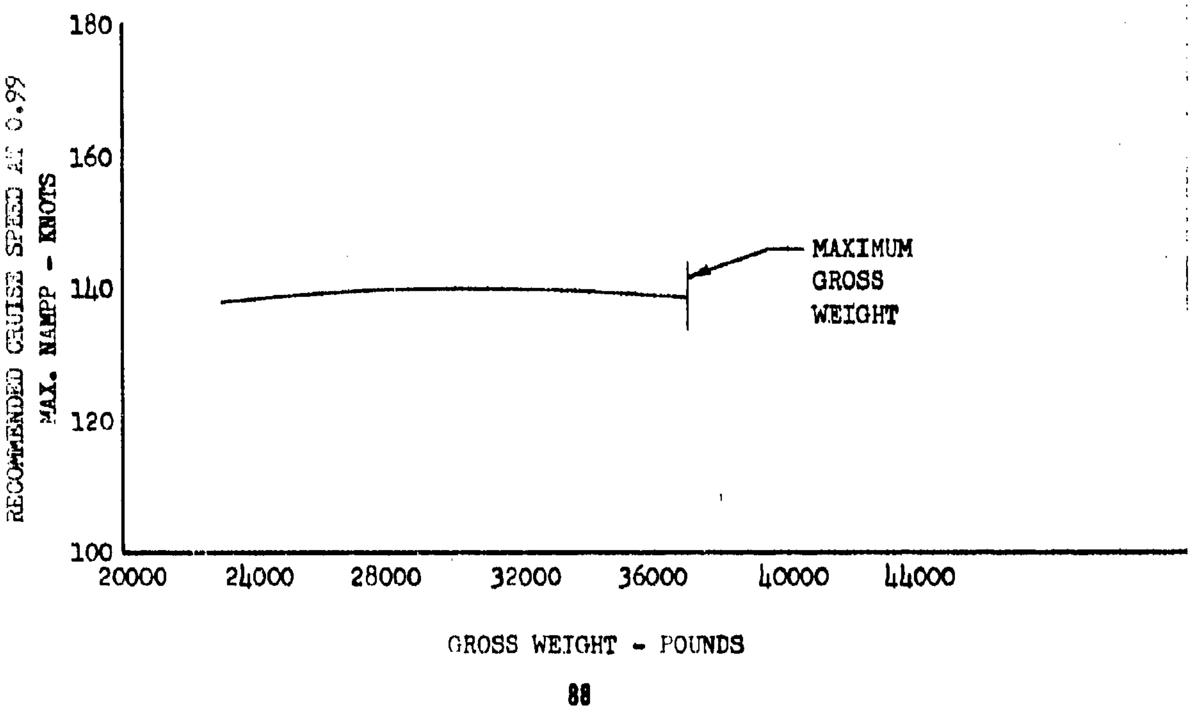
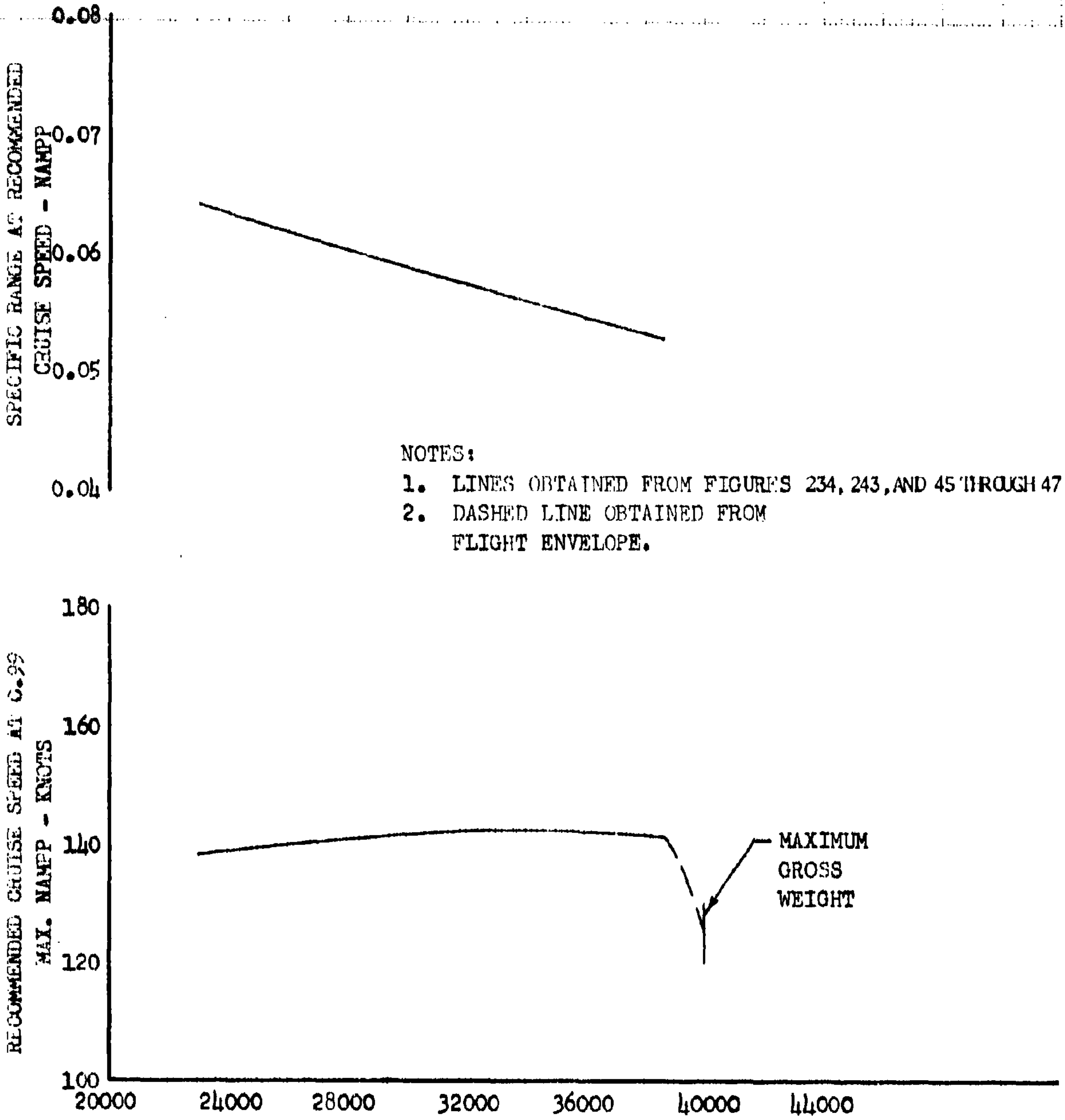


FIGURE NO. 53
LEVEL FLIGHT RANGE SUMMARY
CH-47B U.S.A. S/N 66-19100

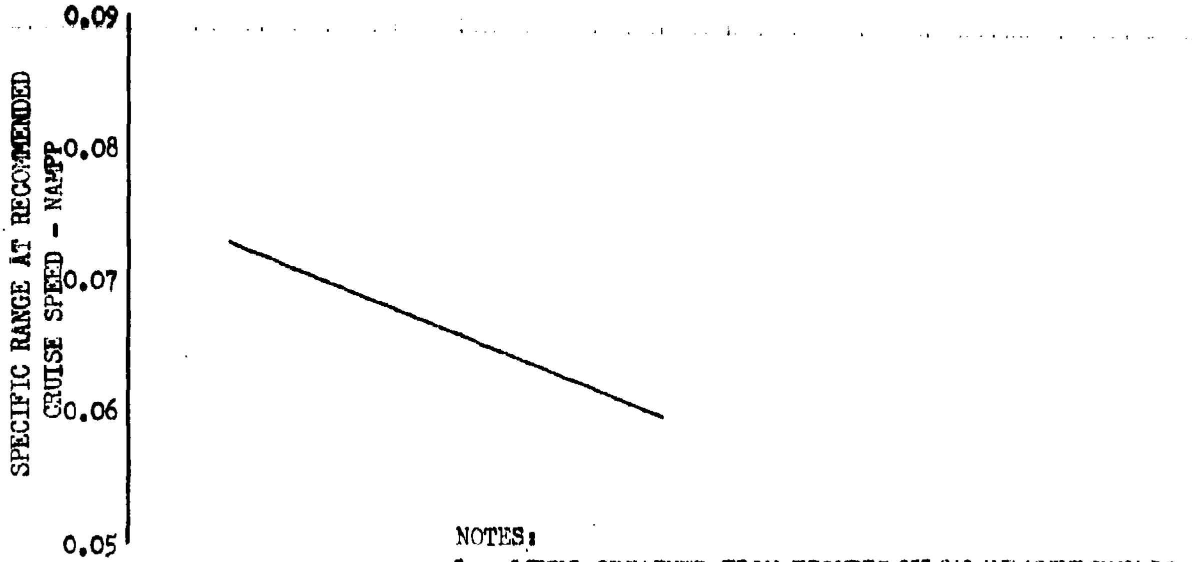
SEA LEVEL
STANDARD DAY
ROTOR SPEED = 230 R.P.M.



NOTES:
1. LINES OBTAINED FROM FIGURES 234, 243, AND 45 THROUGH 47
2. DASHED LINE OBTAINED FROM FLIGHT ENVELOPE.

FIGURE NO. 54
LEVEL FLIGHT RANGE SUMMARY
CH-47B U.S.A. S/N 66-19100

5000 FEET
STANDARD DAY
ROTOR SPEED = 225 R.P.M.



NOTES:
1. LINES OBTAINED FROM FIGURES 233, 242 AND 48 THROUGH 50.
2. DASHED LINE OBTAINED FROM FLIGHT ENVELOPE.

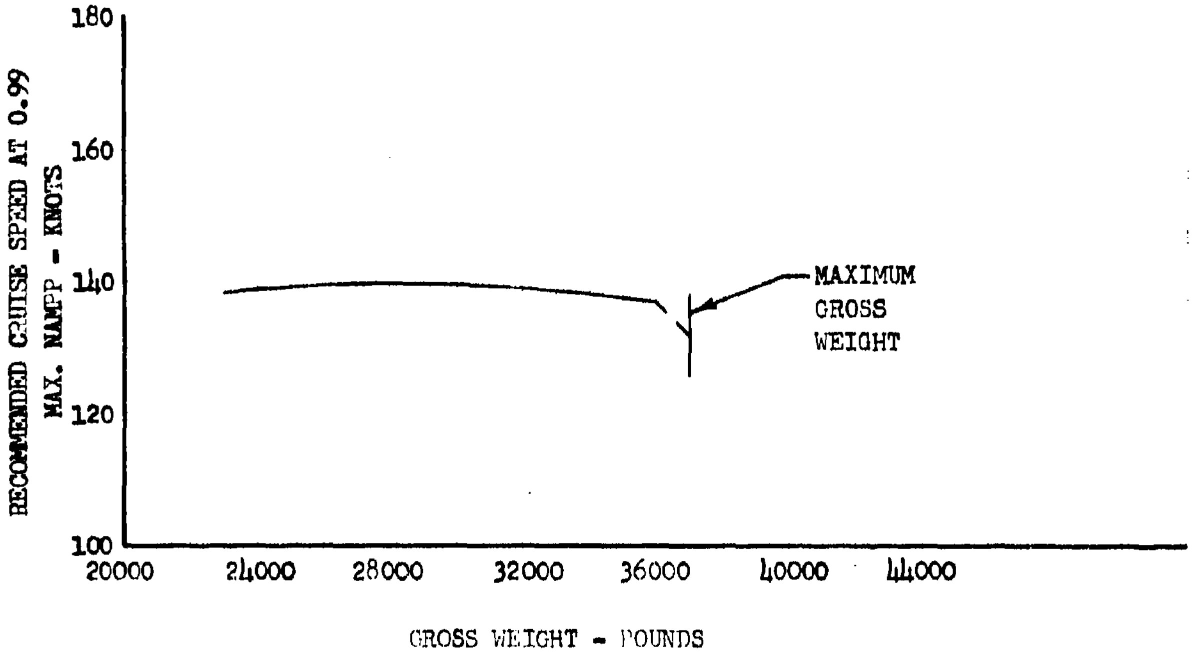
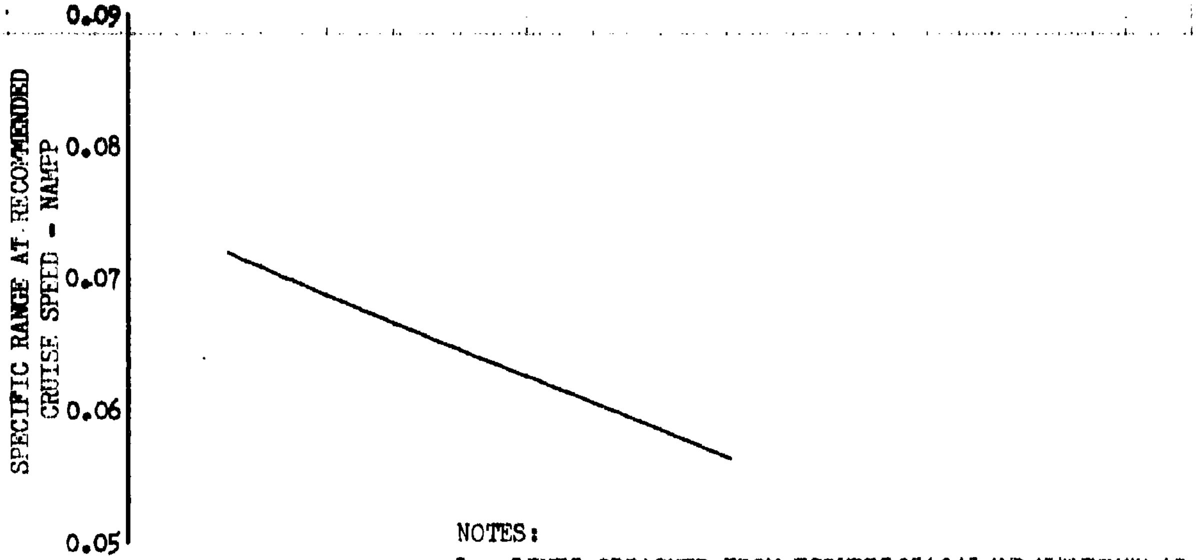


FIGURE NO. 55
LEVEL FLIGHT RANGE SUMMARY
CH-47B U.S.A. S/N 66-19100

5000 FEET
STANDARD DAY
ROTOR SPEED = 230 R.P.M.



NOTES:
1. LINES OBTAINED FROM FIGURES 234,243 AND 45 THROUGH 47.
2. DASHED LINE OBTAINED FROM FLIGHT ENVELOPE.

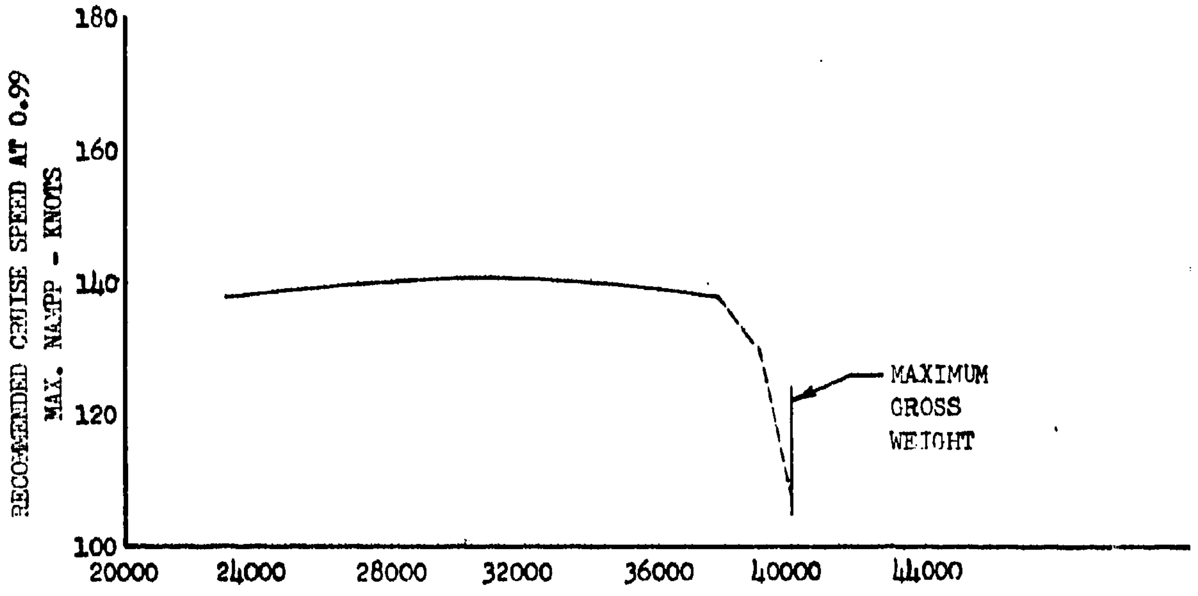
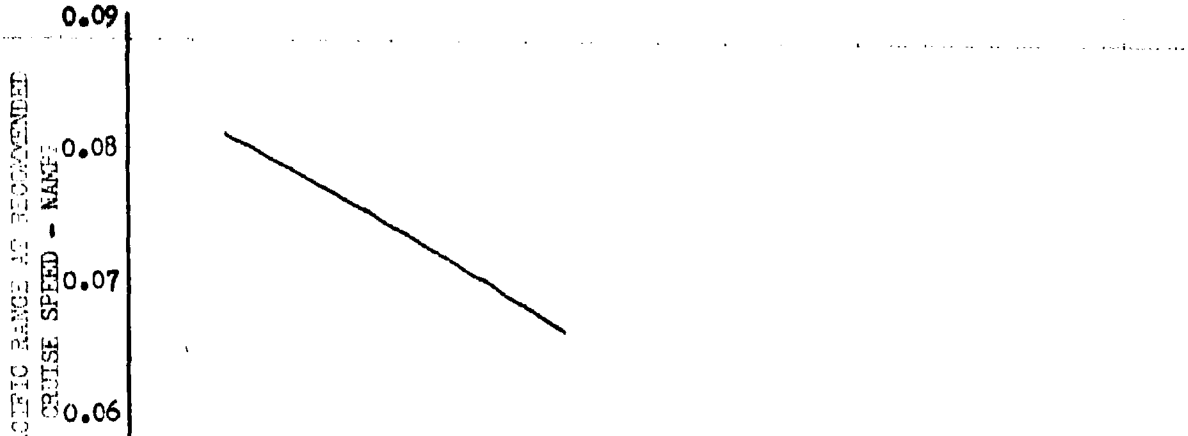


FIGURE NO. 56
LEVEL FLIGHT RANGE SUMMARY
CH-47B U.S.A. S/N 66-19100

10000 FEET
STANDARD DAY
ROTOR SPEED = 225 R.P.M.



NOTES:
1. LINES OBTAINED FROM FIGURES 233, 242 AND 48 THROUGH 50.
2. DASHED LINE OBTAINED FROM FLIGHT ENVELOPE.

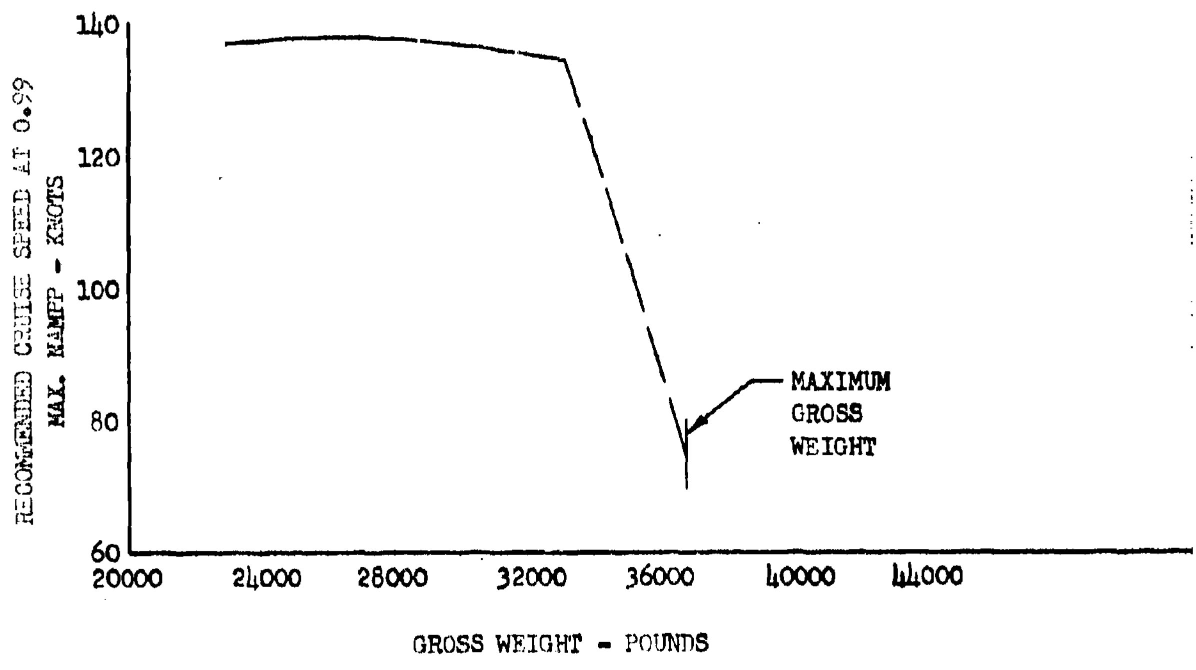
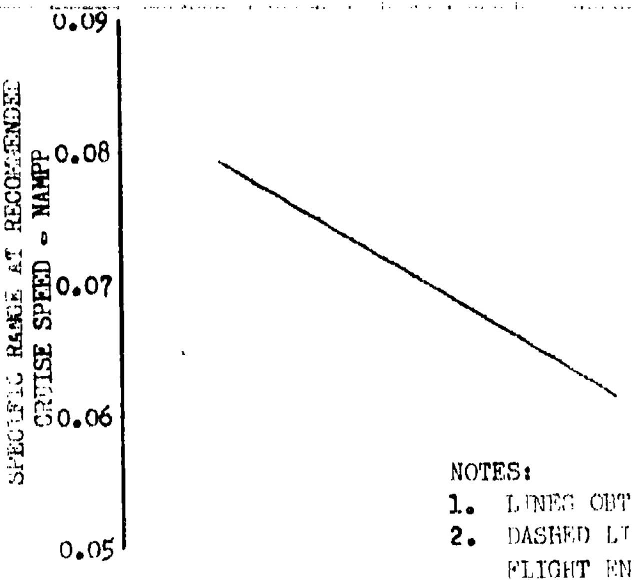


FIGURE NO. 57
LEVEL FLIGHT RANGE SUMMARY
CH-47B U.S.A. S/N 66-19100

10000 FEET
STANDARD DAY
ROTOR SPEED = 230 R.P.M.



NOTES:
1. LINES OBTAINED FROM FIGURES 234, 243 AND 45 THROUGH 47.
2. DASHED LINE OBTAINED FROM FLIGHT ENVELOPE.

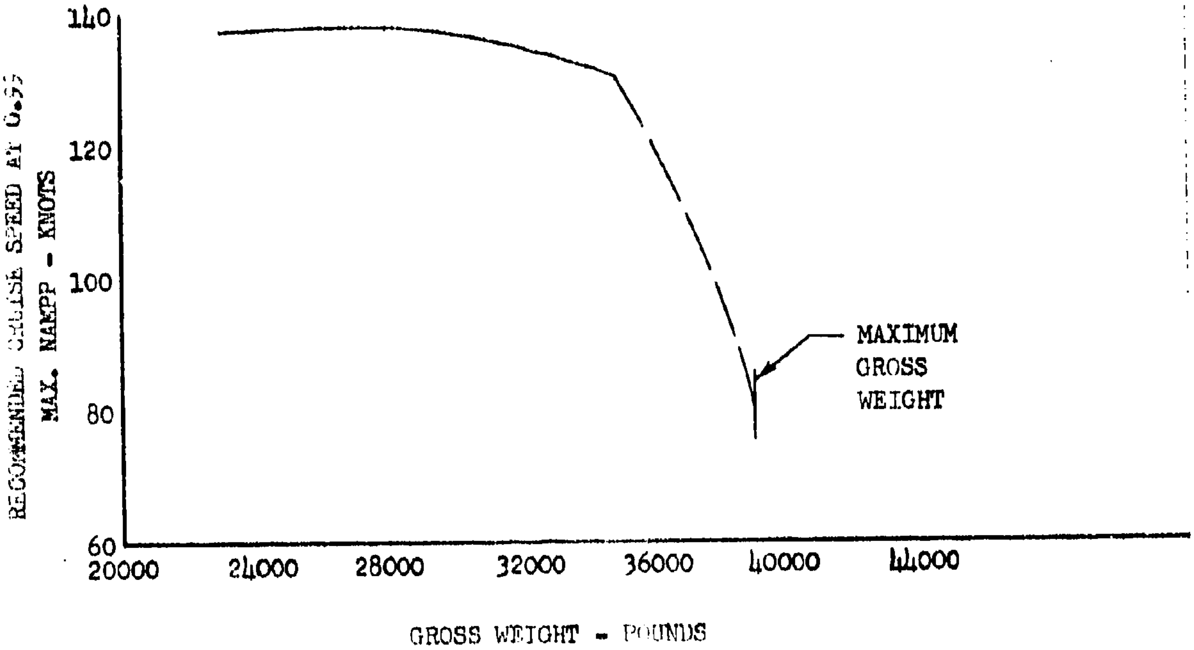


FIGURE NO. 58
ROTOR EFFICIENCY IN LEVEL FLIGHT
CH-47B U.S.A. S/N 66-19100

$V/\sqrt{\theta}$ = 40 KTS

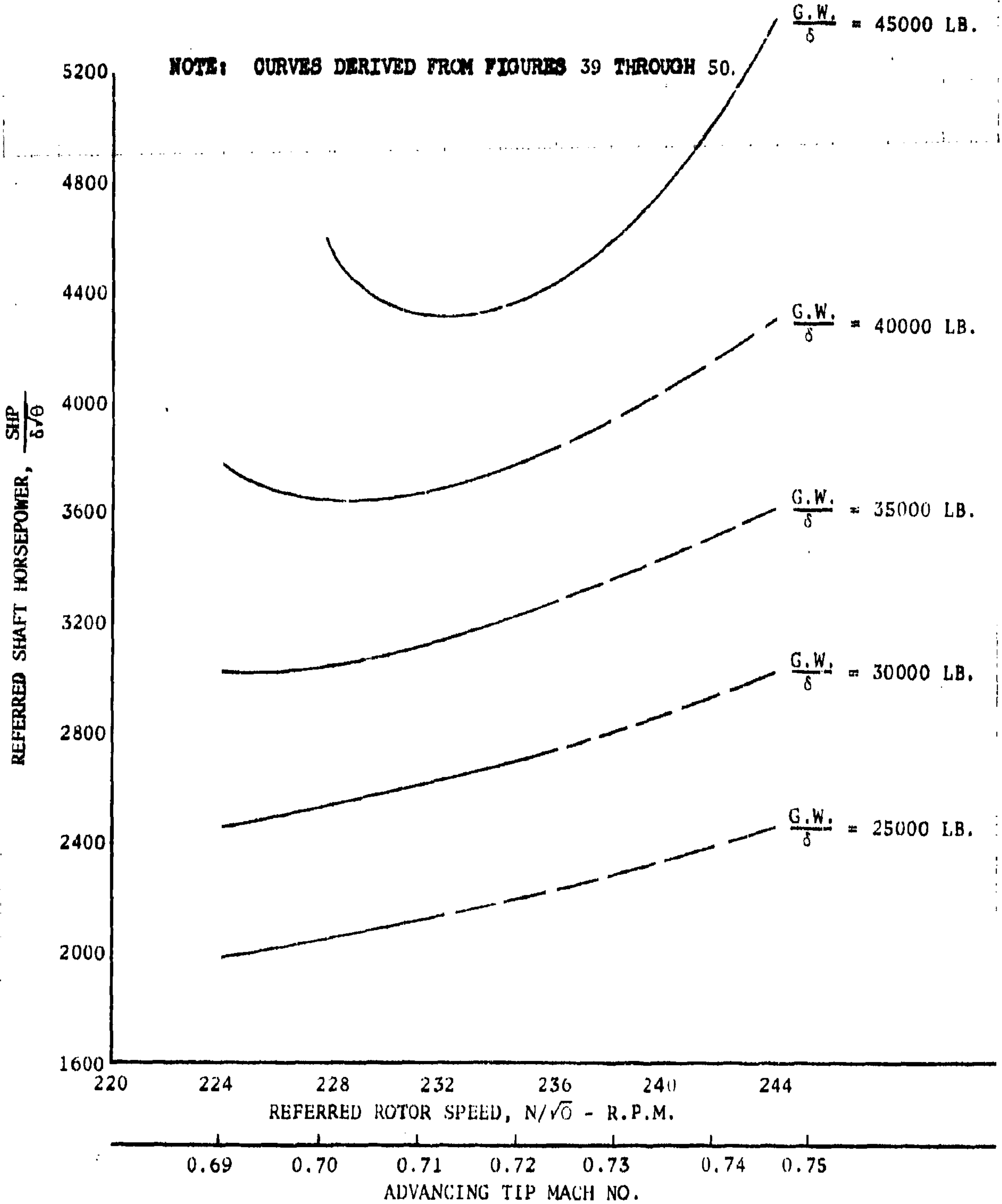


FIGURE NO. 59
ROTOR EFFICIENCY IN LEVEL FLIGHT
CH-47B U.S.A. S/N 66-19100

$V/\sqrt{\Theta}$ = 50 KTS

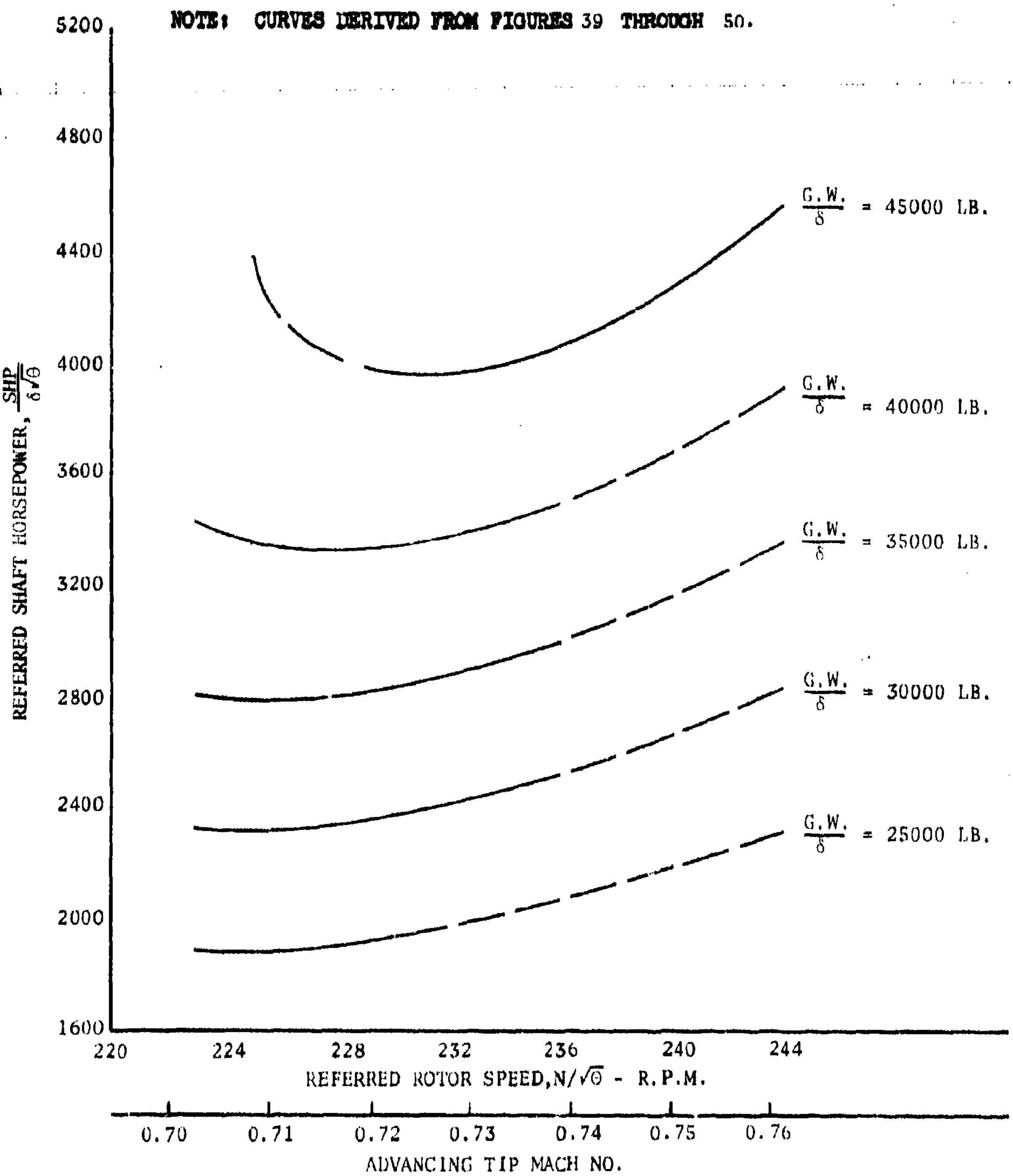


FIGURE NO. 60
ROTOR EFFICIENCY IN LEVEL FLIGHT
CH-47B U.S.A. S/N 66-19100

$V/\sqrt{\Theta}$ = 60 KTS

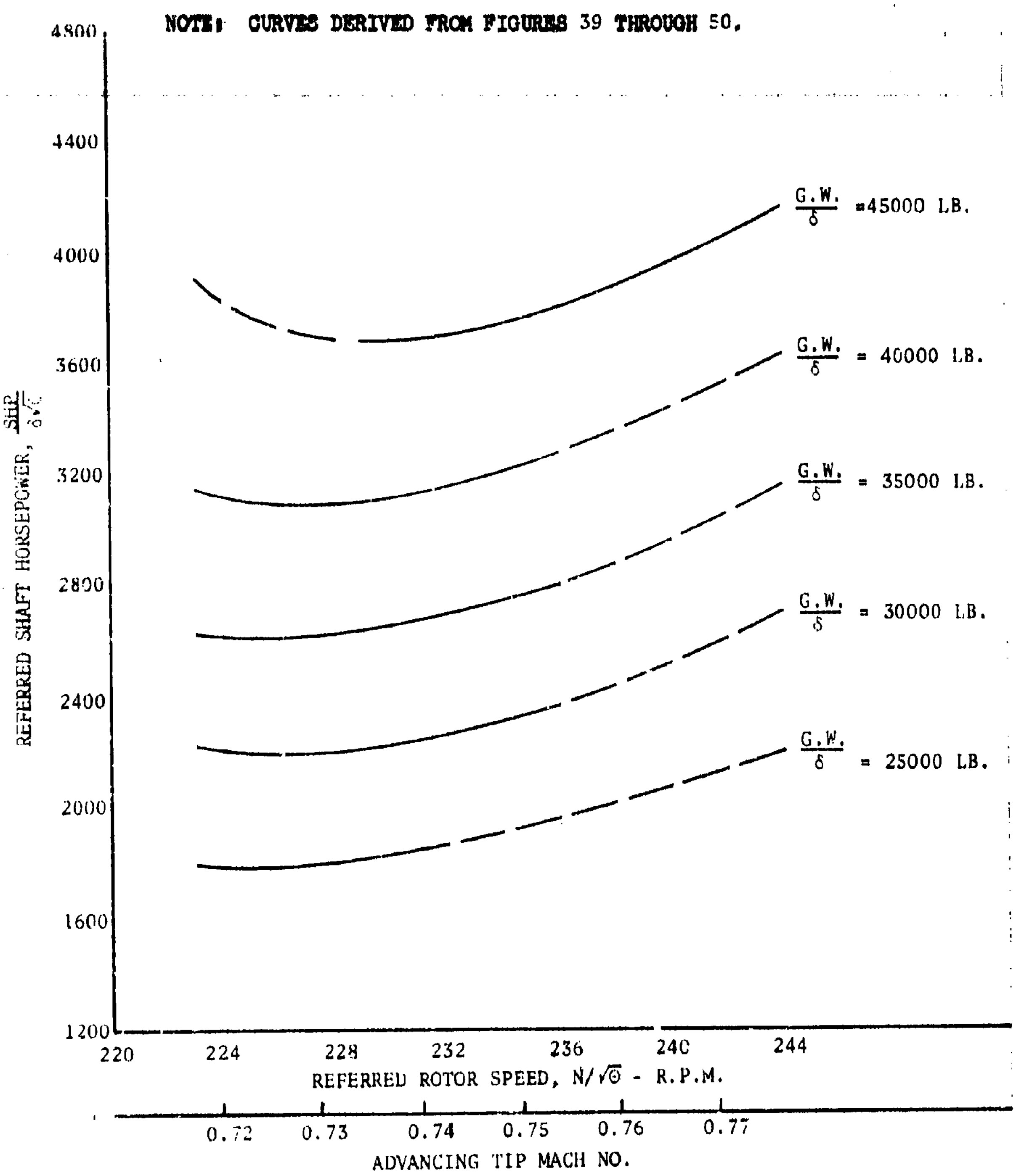


FIGURE NO. 61

ROTOR EFFICIENCY IN LEVEL FLIGHT

CH-47B U.S.A. S/N 66-19100

$V/\sqrt{\theta}$ = 70 KTS

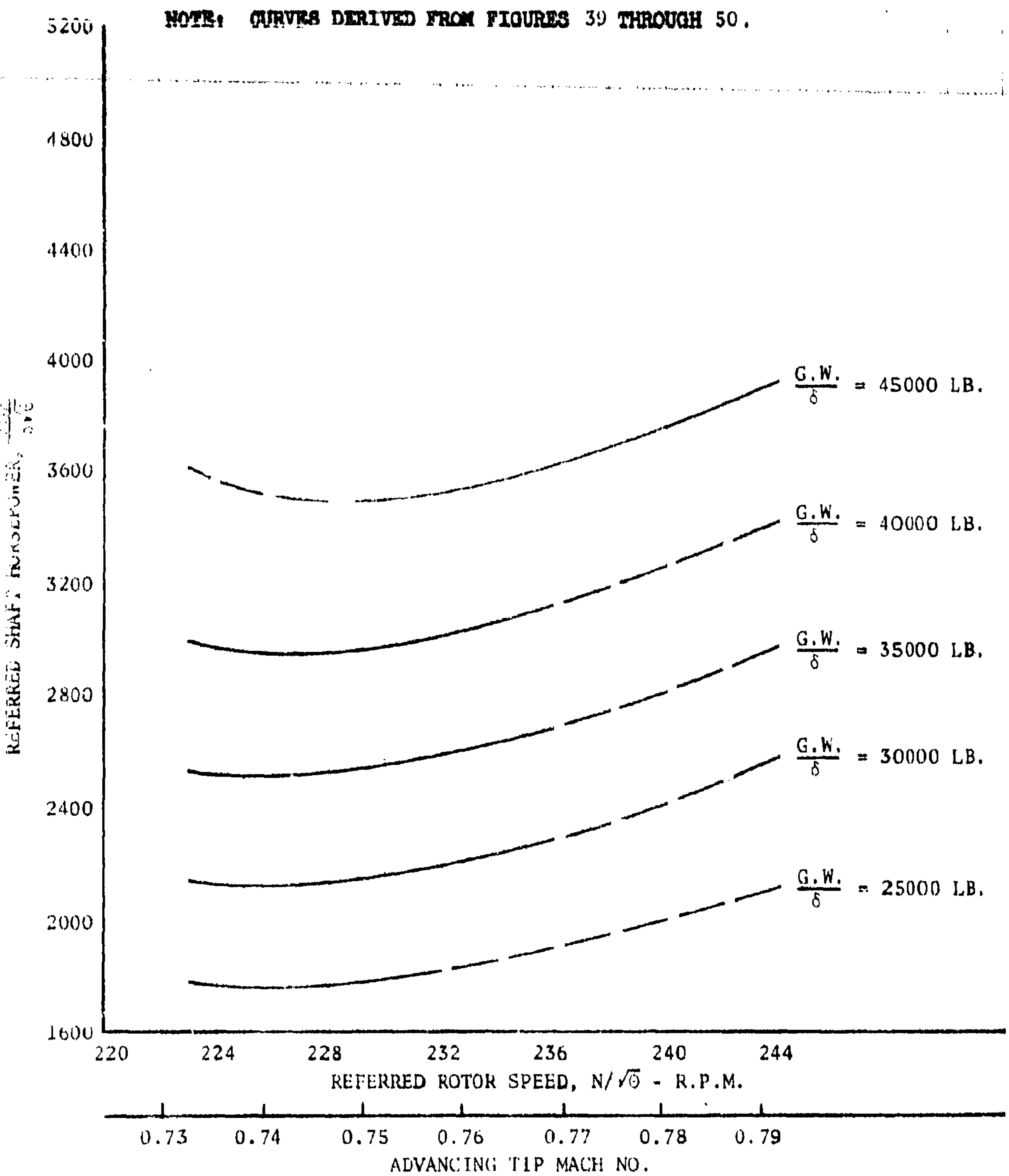


FIGURE NO. 62
ROTOR EFFICIENCY IN LEVEL FLIGHT
CH-47B U.S.A. S/N 66-19100

$V/\sqrt{\Theta}$ =80 KTS

NOTE: CURVES DERIVED FROM FIGURES 39 **THROUGH** 50.

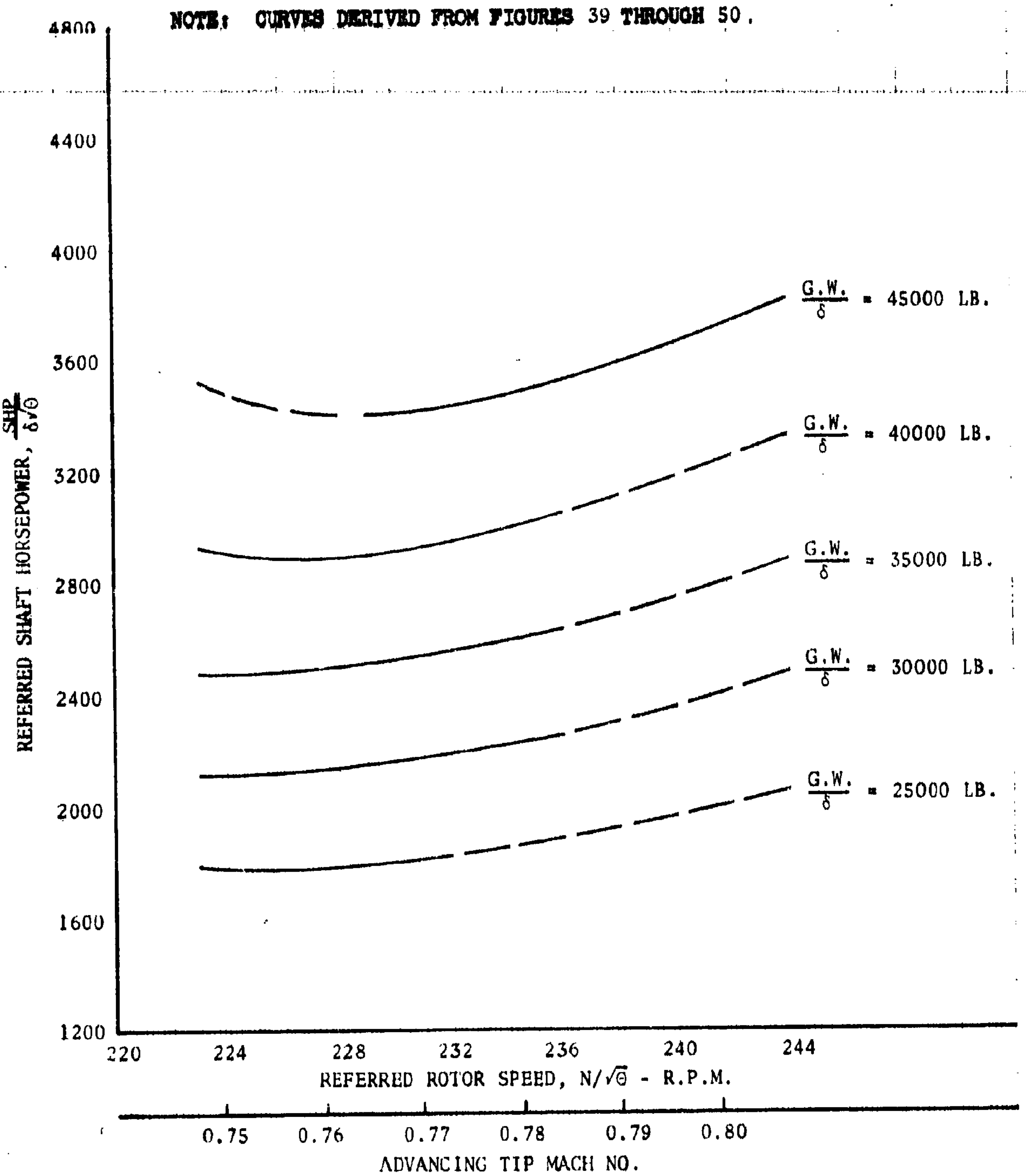


FIGURE NO. 63
ROTOR EFFICIENCY IN LEVEL FLIGHT
CH-47B U.S.A. S/N 66-19100

$V/\sqrt{\theta}$ = 90 KTS

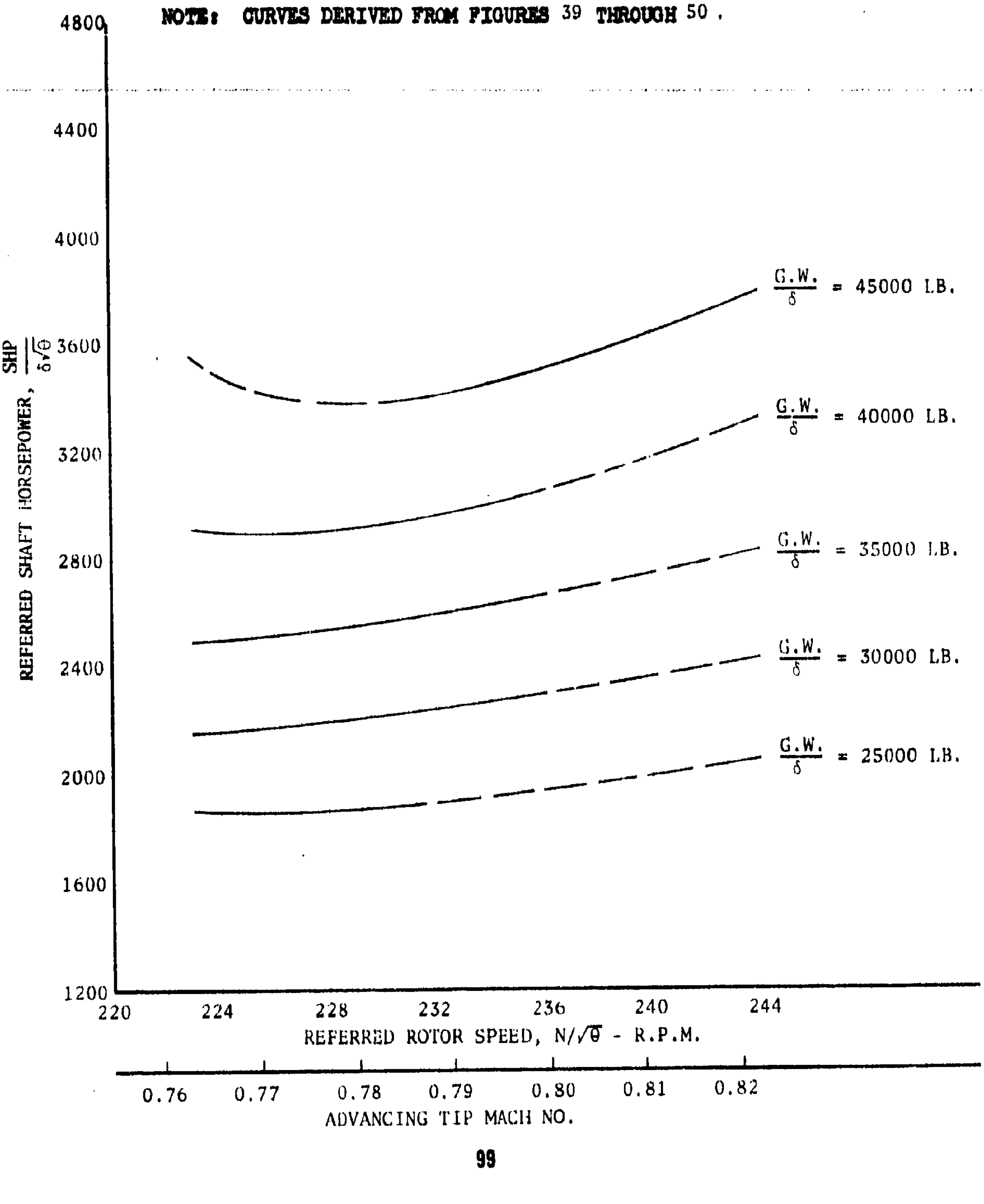


FIGURE NO. 64

ROTOR EFFICIENCY IN LEVEL FLIGHT

CH-47B U.S.A. S/N 66-19100

$V/\sqrt{\theta}$ = 100 KTS

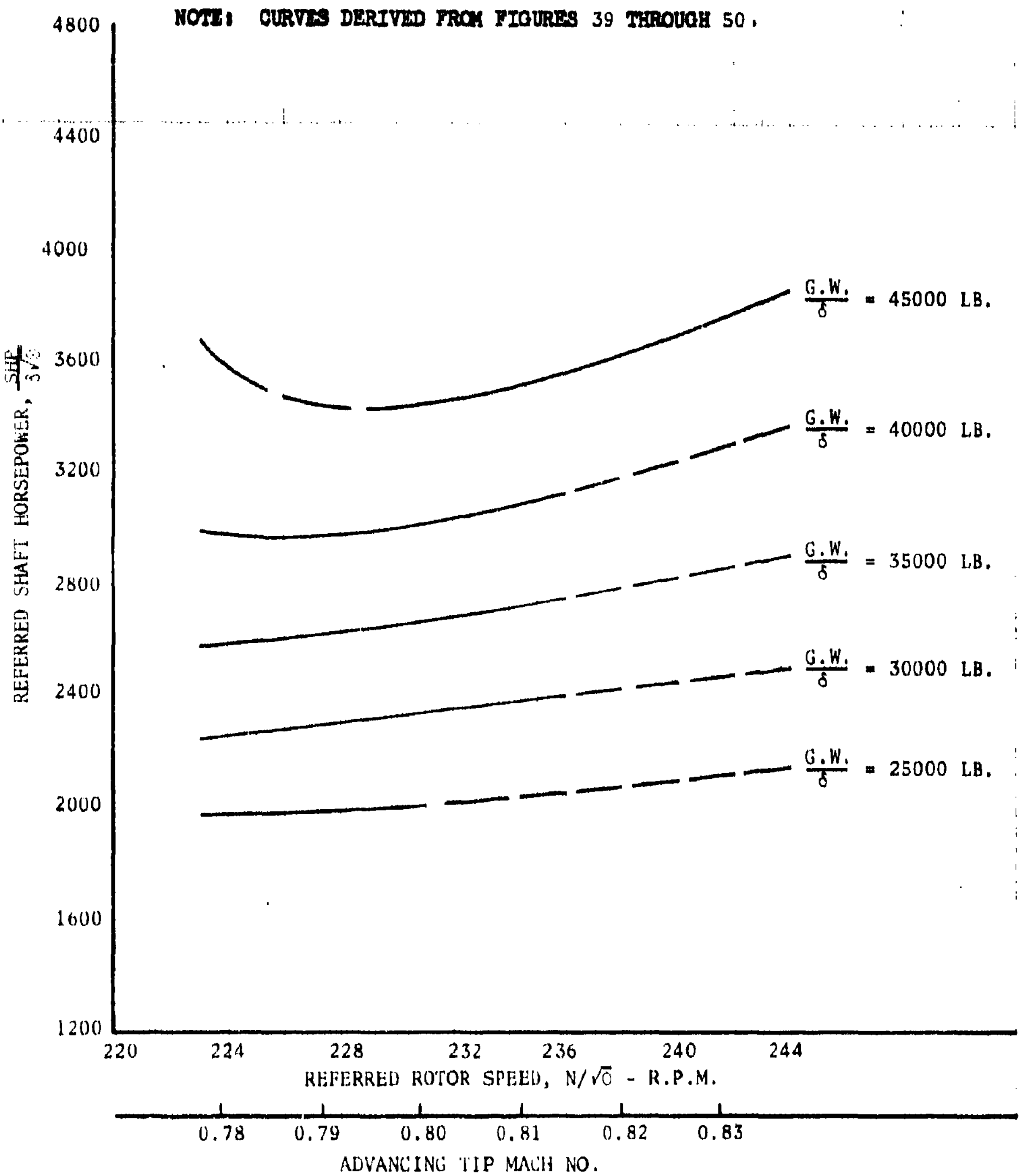


FIGURE NO. 65
ROTOR EFFICIENCY IN LEVEL FLIGHT
CH-47B U.S.A. S/N 66-19100

$V/\sqrt{\theta}$ = 110 KTS

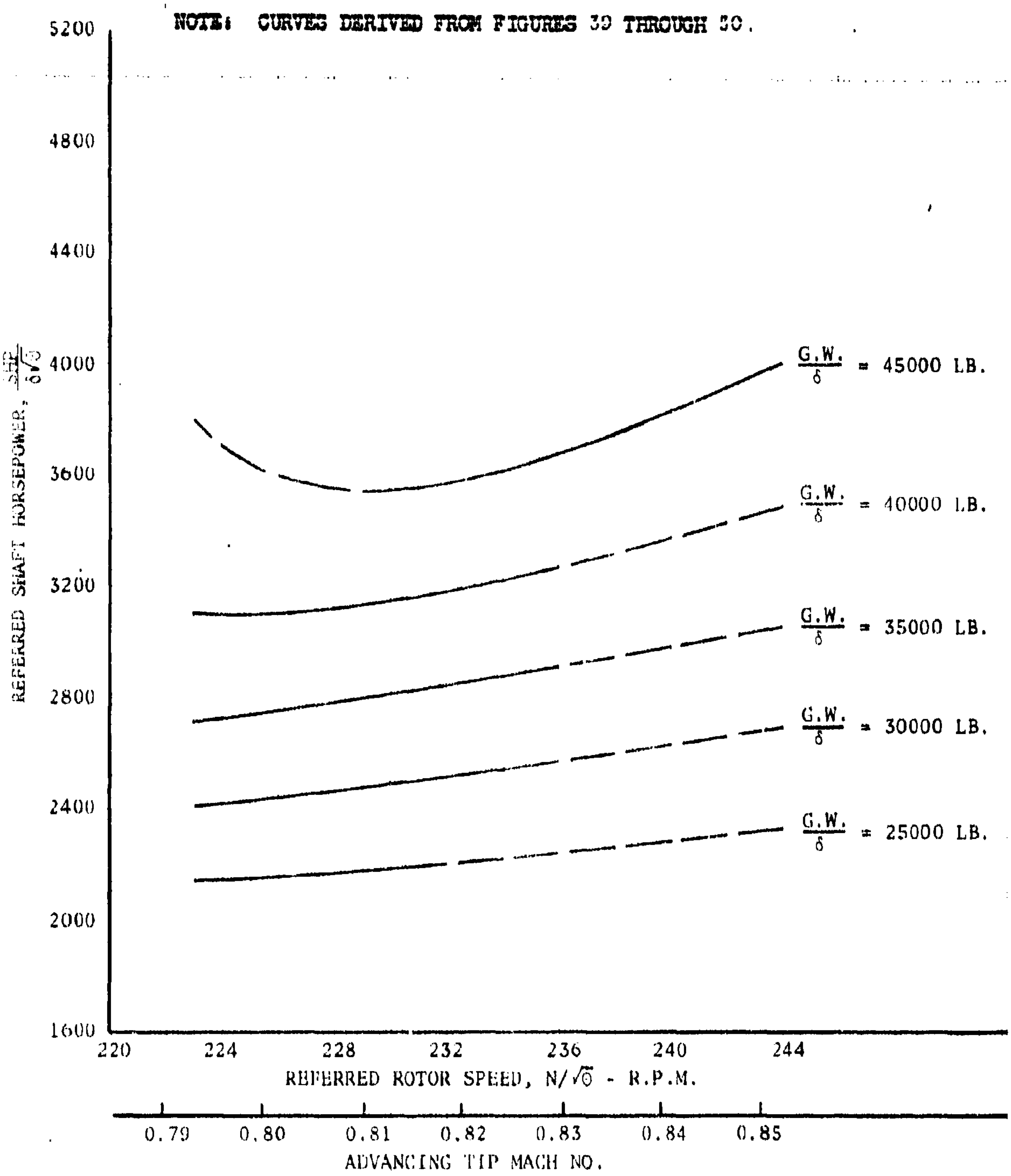


FIGURE NO. 66
ROTOR EFFICIENCY IN LEVEL FLIGHT
CH-47B U.S.A. S/N 66-19100

$V/\sqrt{\theta}$ = 120 KTS

NOTE: CURVES DERIVED FROM FIGURES 39 THROUGH 50.

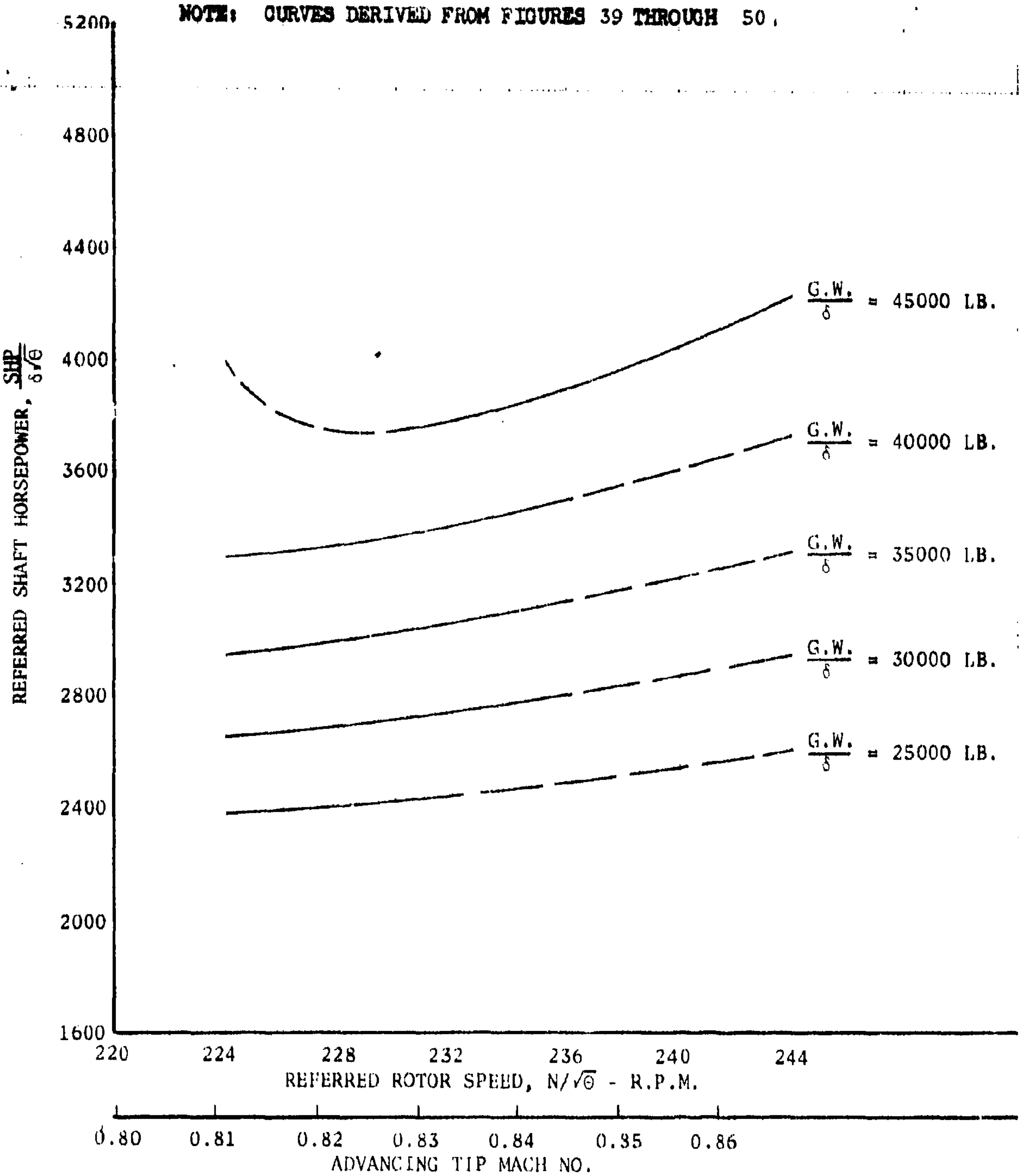


FIGURE NO. 67
ROTOR EFFICIENCY IN LEVEL FLIGHT
CH-47B U.S.A. S/N 66-19100

$V/\sqrt{\theta}$ = 130 KTS

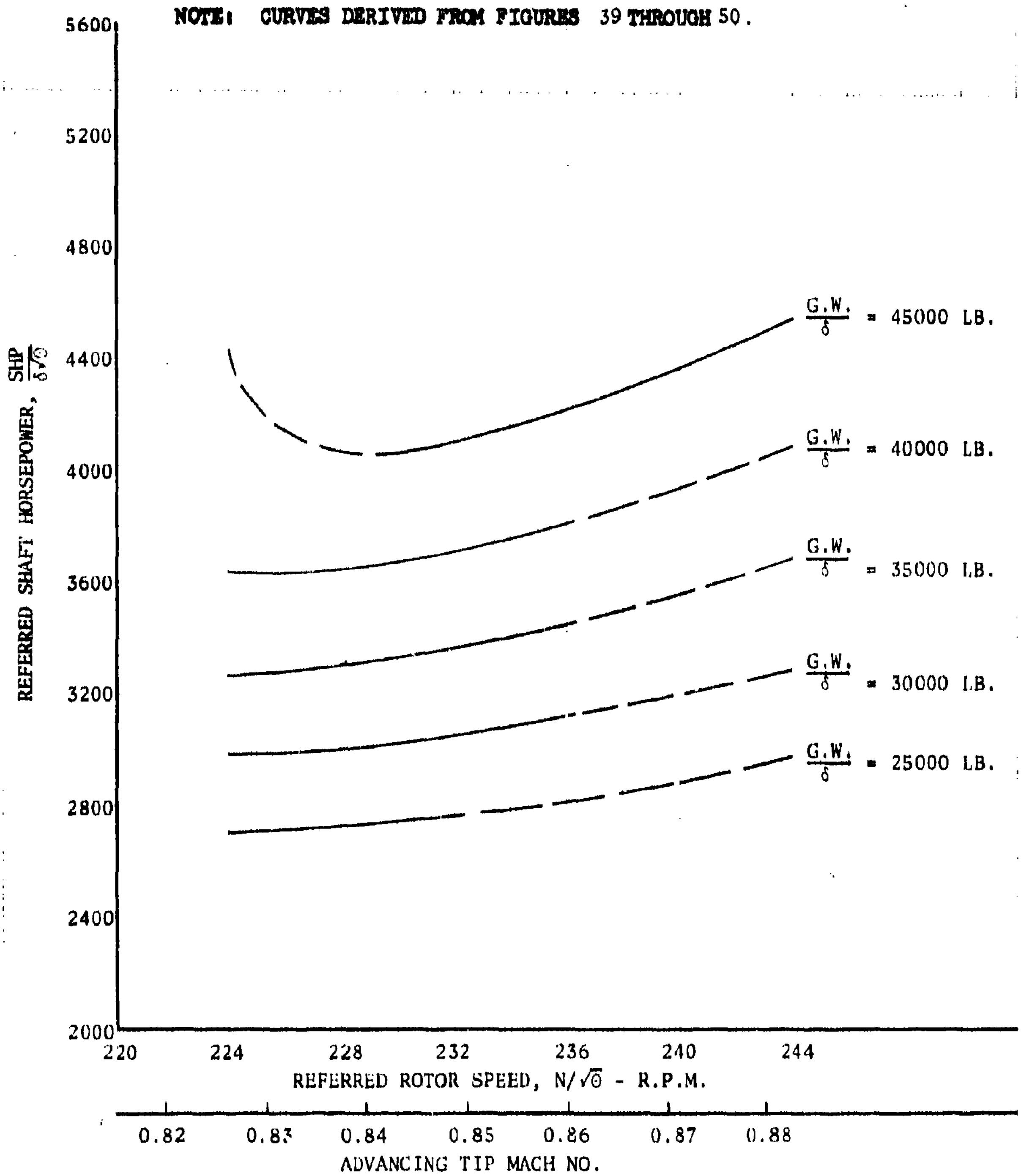


FIGURE NO. 68
ROTOR EFFICIENCY IN LEVEL FLIGHT
CH-47B U.S.A. S/N 66-19100

$V/\sqrt{\theta} = 140$ KTS

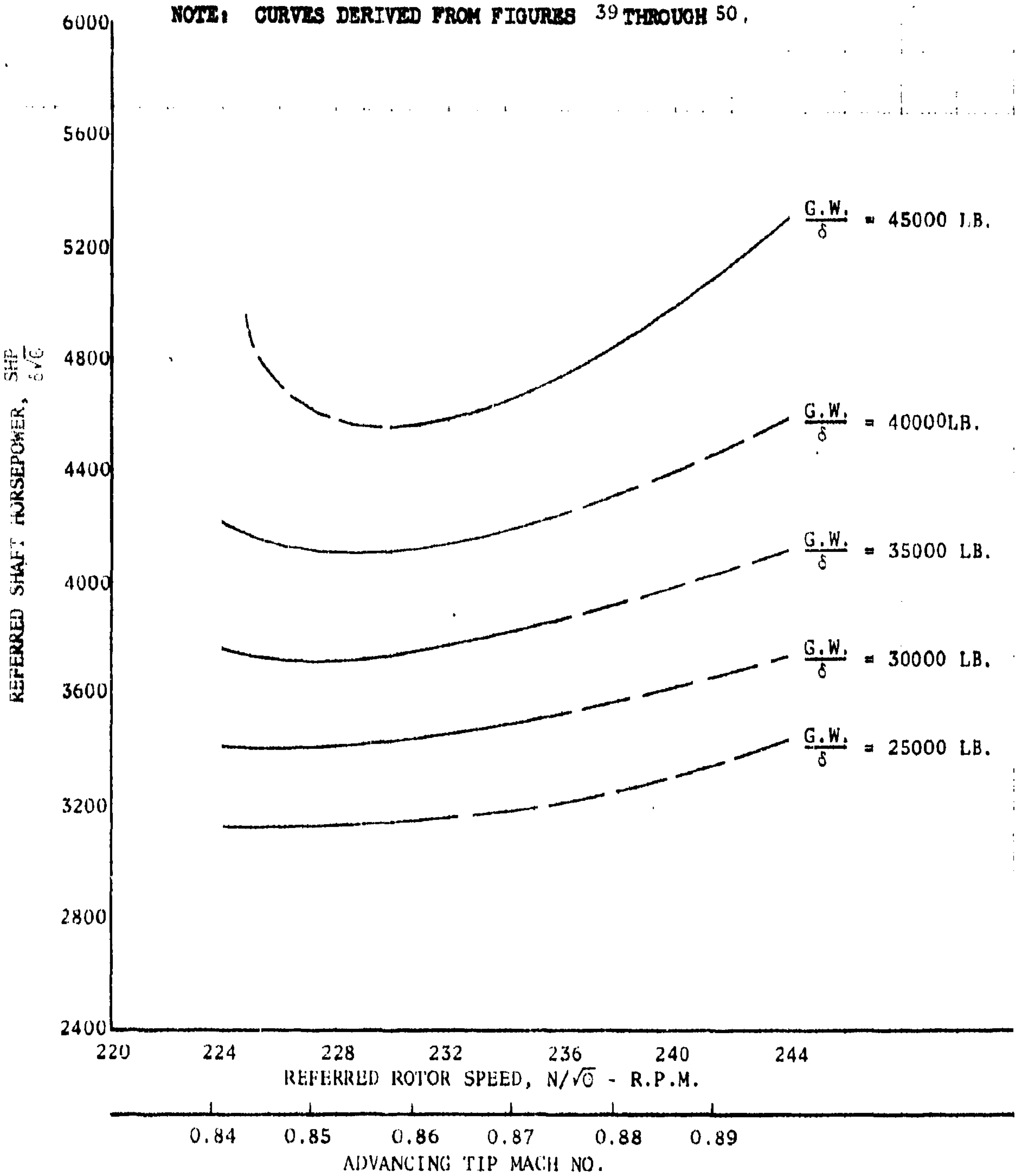


FIGURE NO. 69
ROTOR EFFICIENCY IN LEVEL FLIGHT
CH-47B U.S.A. S/N 66-19100

$V/\sqrt{\theta}$ = 150 KTS

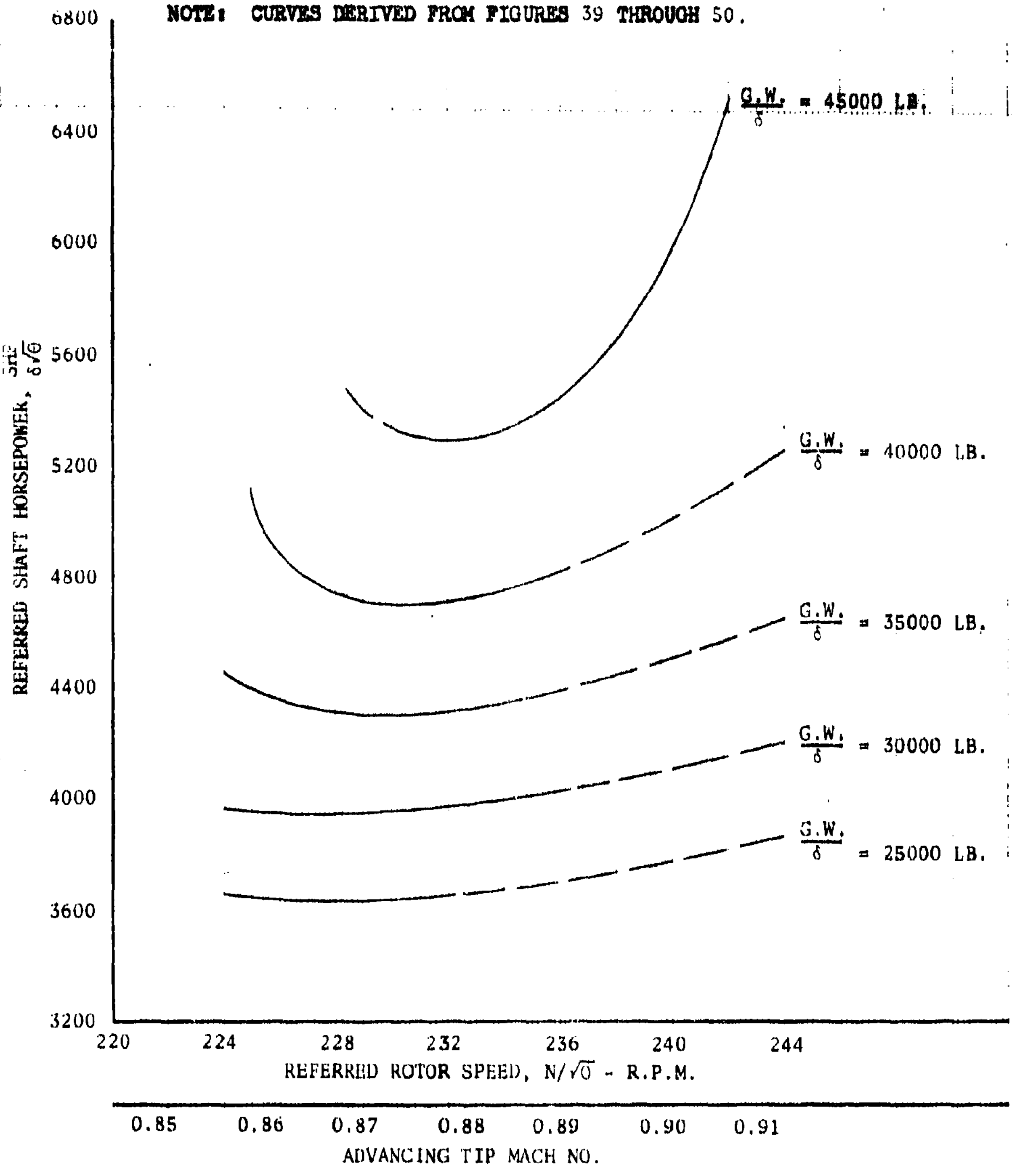


FIGURE NO. 70
CLIMB PERFORMANCE
CH-47B U.S.A. S/N 66-19100
SINGLE ENGINE
STANDARD DAY

MILITARY RATED POWER
TAKEOFF GROSS WEIGHT = 30310 LB.

C.G. LOCATION = MID
ROTOR SPEED = 225 R.P.M.

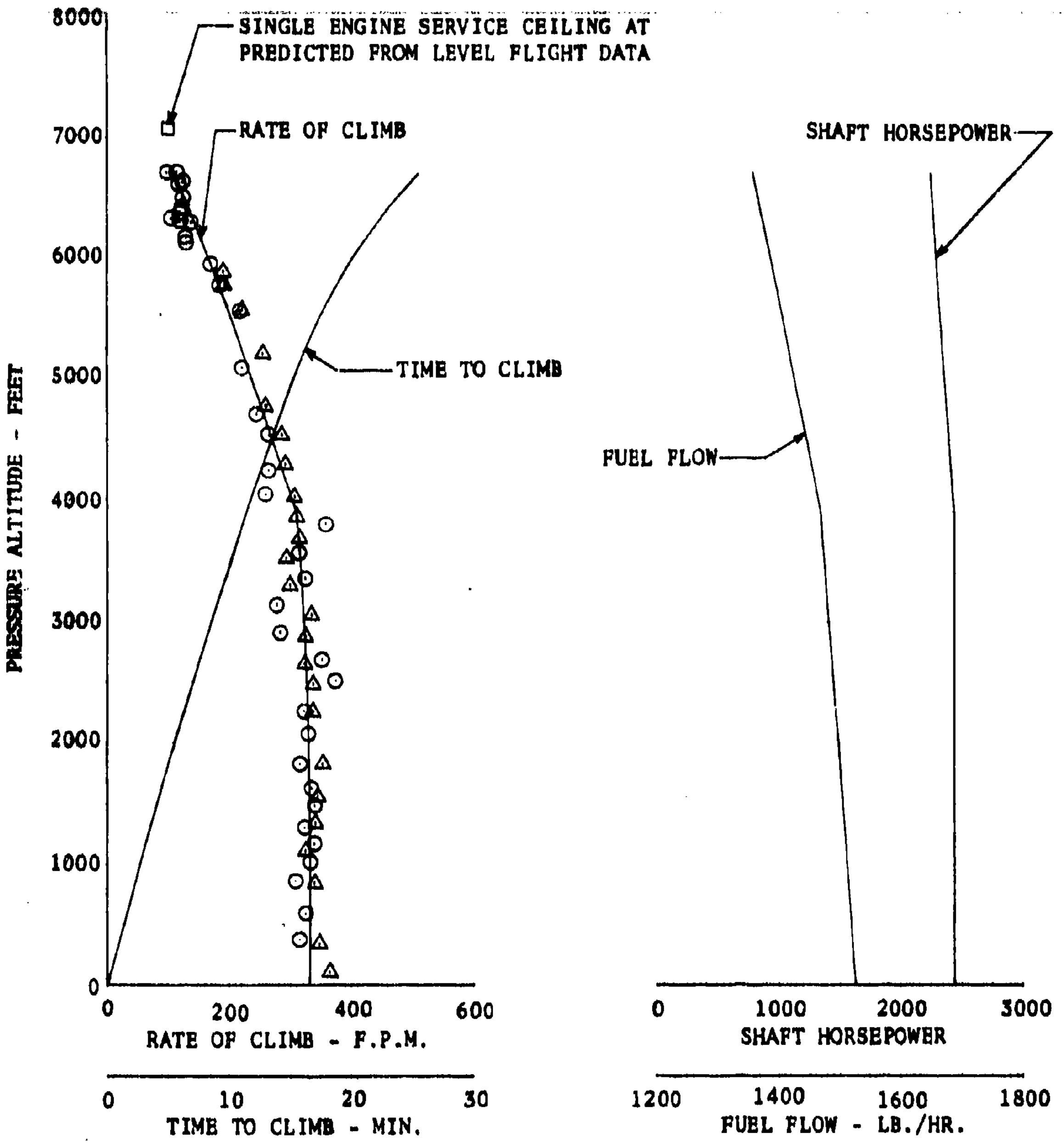


FIGURE NO. 71
CLIMB PERFORMANCE (CONCLUDED)
CH-47B U.S.A. S/N 66-19100

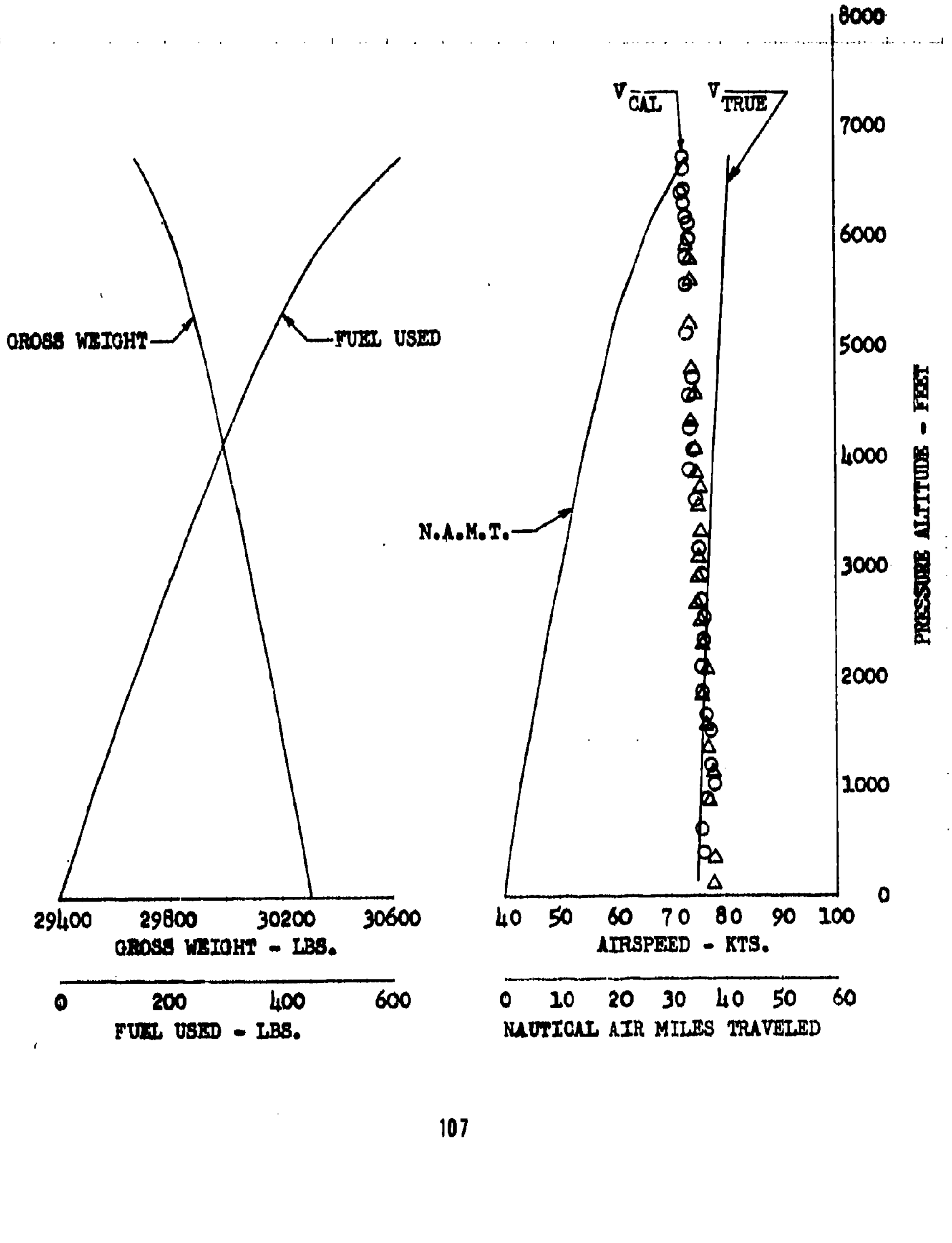


FIGURE NO. 72
CLIMB PERFORMANCE
CH-47B U.S.A. S/N 66-19100
SINGLE ENGINE
STANDARD DAY

MILITARY RATED POWER
TAKEOFF GROSS WEIGHT = 27590 LB.

C.G. LOCATION = MID.
ROTOR SPEED = 230 R.P.M.

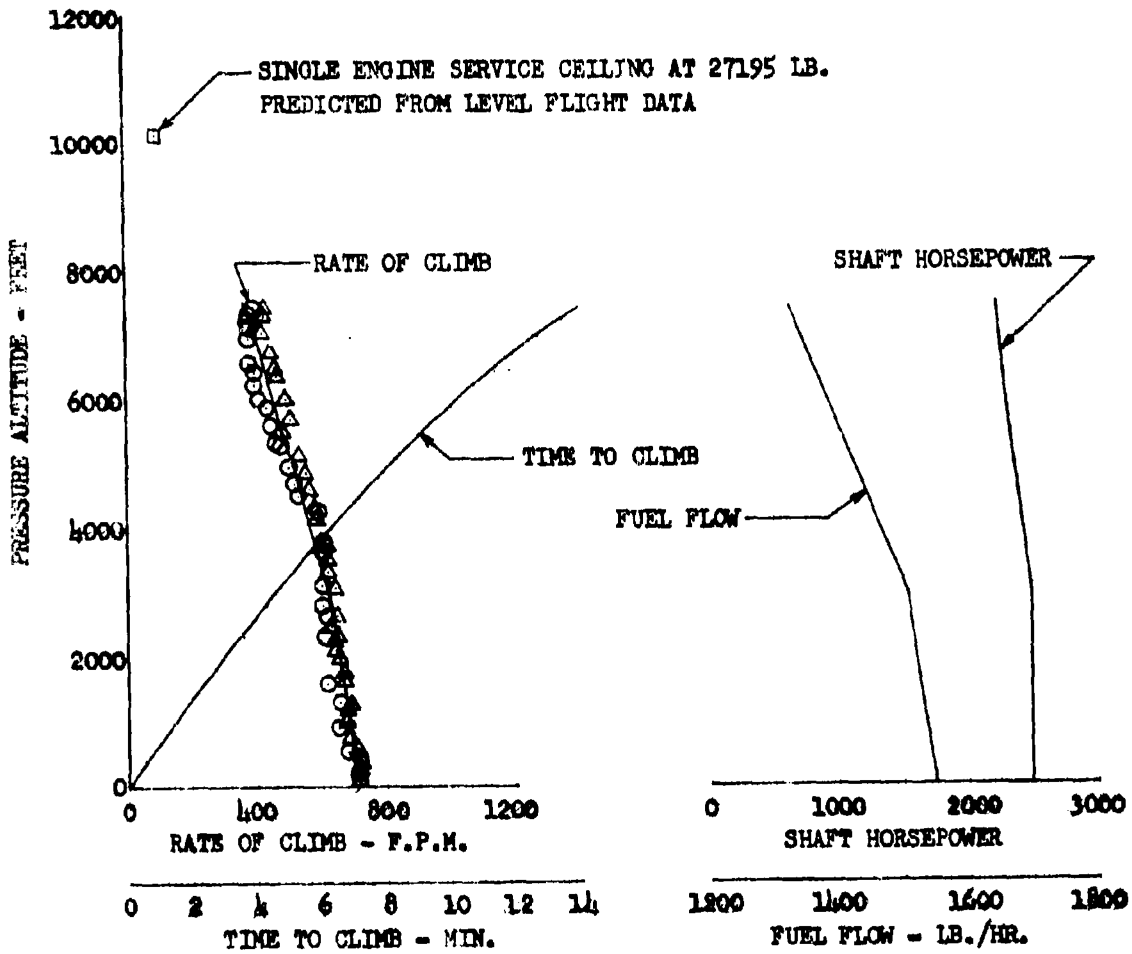


FIGURE NO. 73
CLIMB PERFORMANCE (CONCLUDED)
CH-47B U.S.A. S/N 66-19100

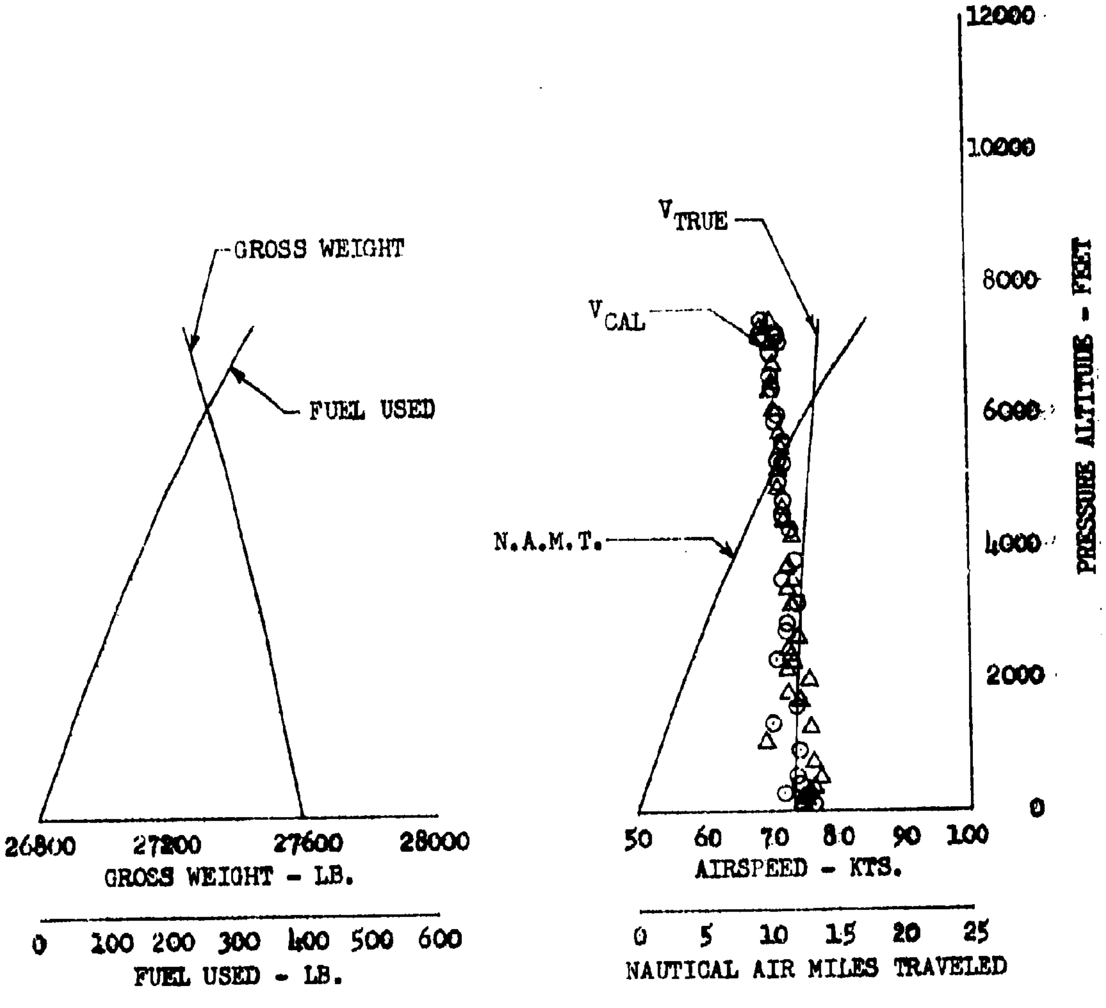


FIGURE NO. 74
CLIMB PERFORMANCE
CH-47B U.S.A. S/N 66-19100
DUAL ENGINE
STANDARD DAY

NORMAL RATED POWER C.G. LOCATION = MID.
TAKEOFF GROSS WEIGHT = 33500 LB. ROTOR SPEED = 230 R.P.M.

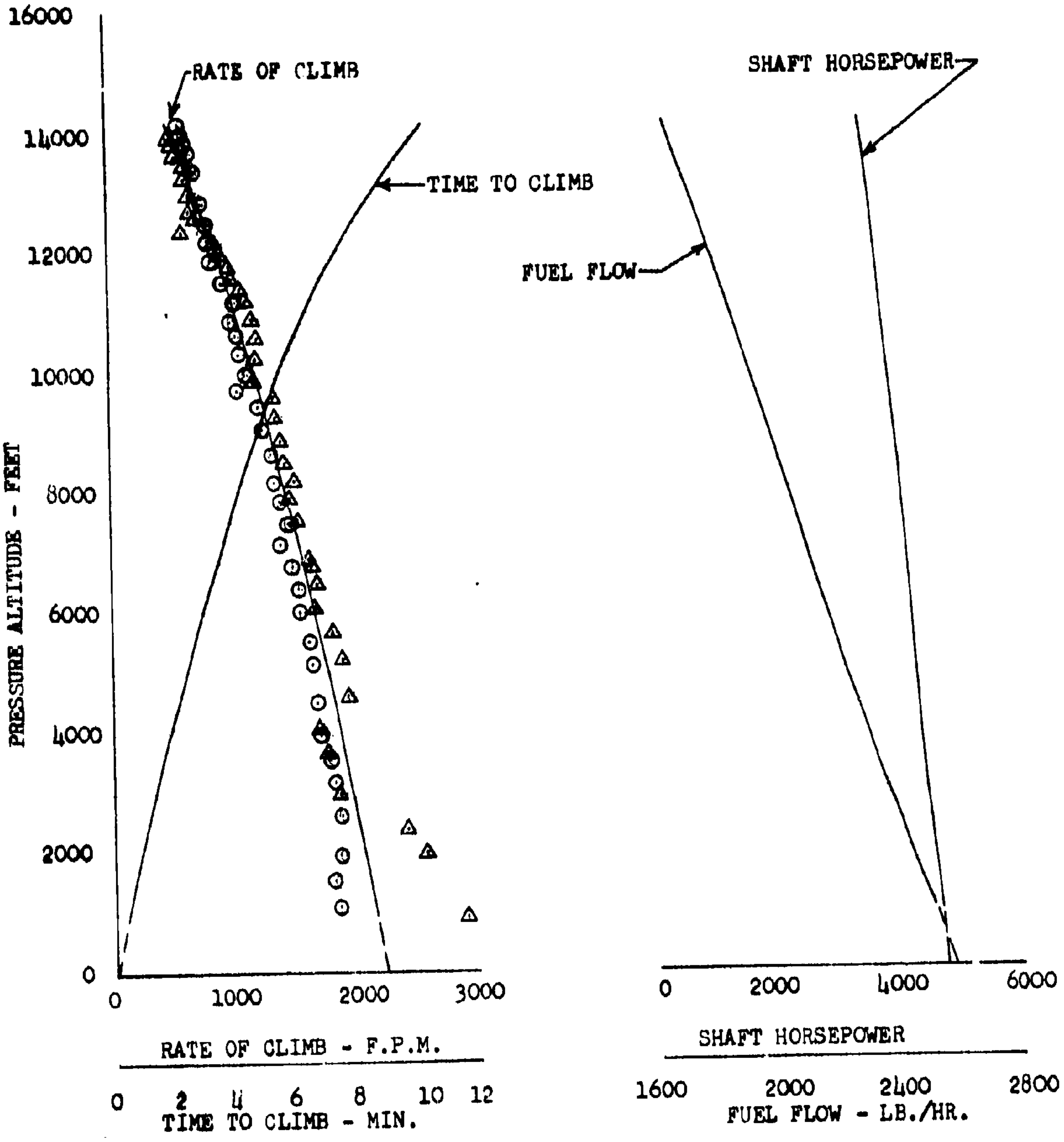


FIGURE NO. 75
CLIMB PERFORMANCE (CONCLUDED)
CH-47B U.S.A. S/N 66-19100

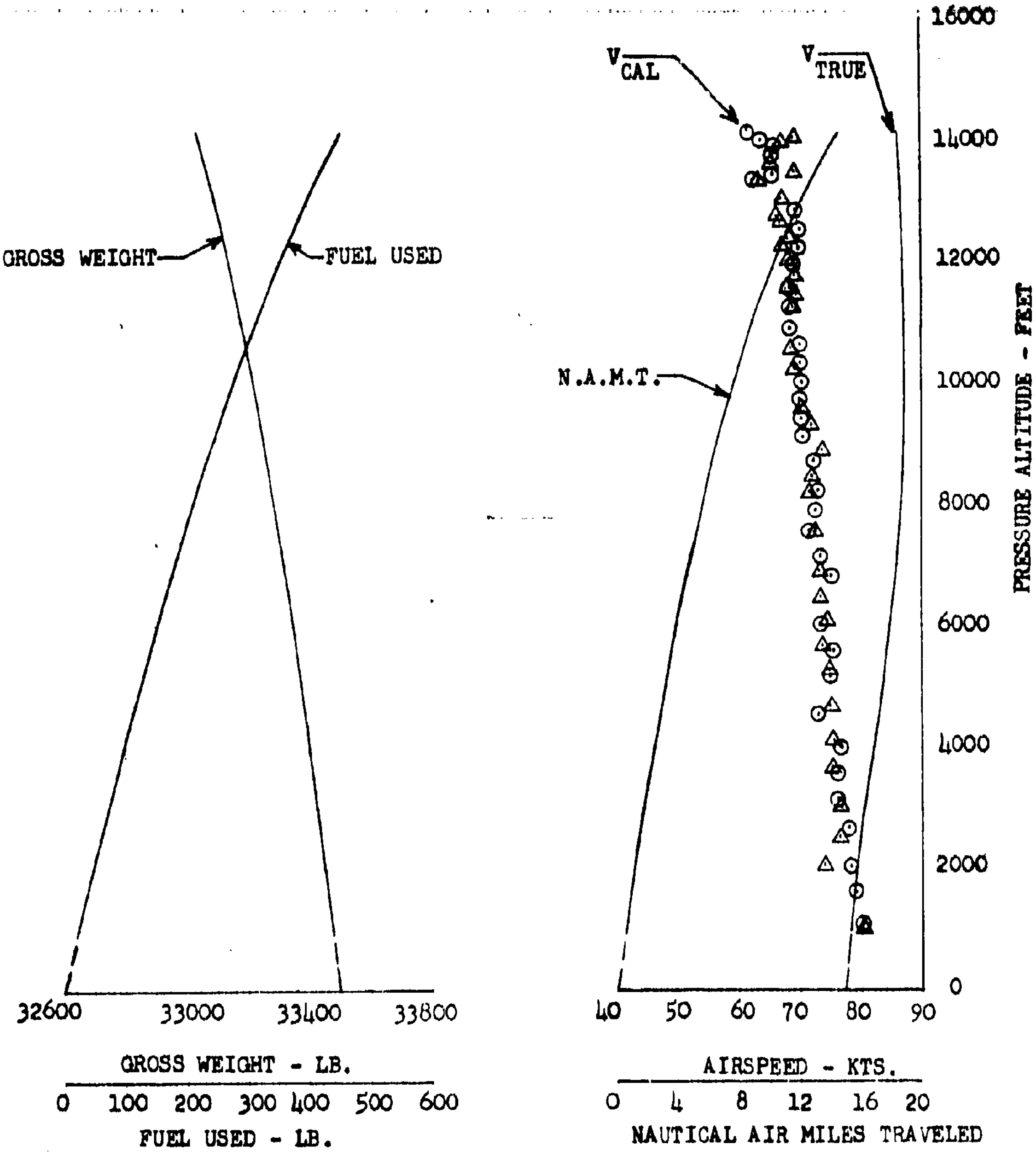


FIGURE NO. 76
CLIMB PERFORMANCE
CH-47B U.S.A. S/N 66-19100
DUAL ENGINE
STANDARD DAY

NORMAL RATED POWER
TAKEOFF GROSS WEIGHT = 33410 LB.

C.G. LOCATION = MID
ROTOR SPEED = 225 R.P.M.

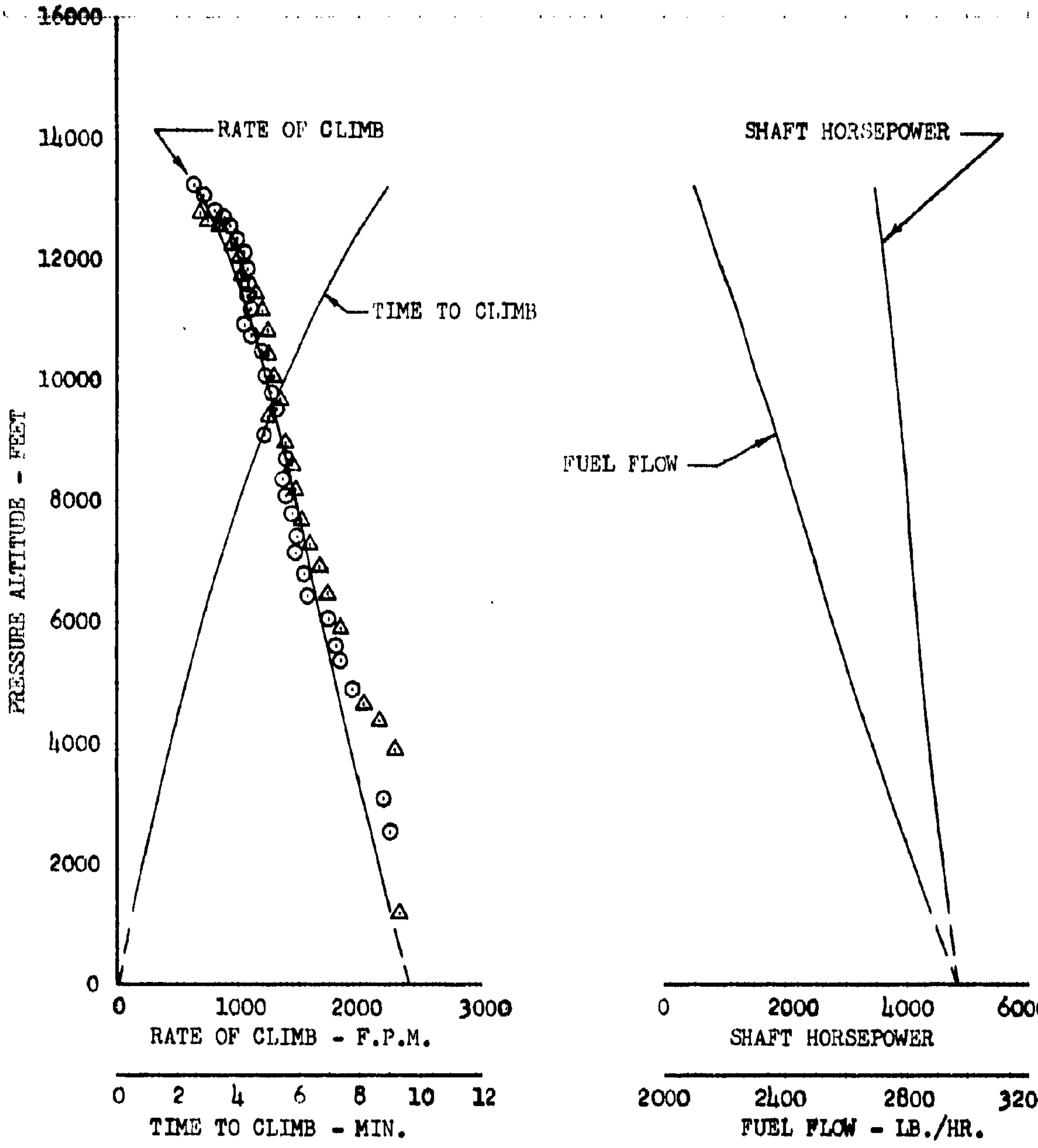


FIGURE NO. 77
CLIMB PERFORMANCE (CONCLUDED)
CH-47B U.S.A. S/N 66-19100

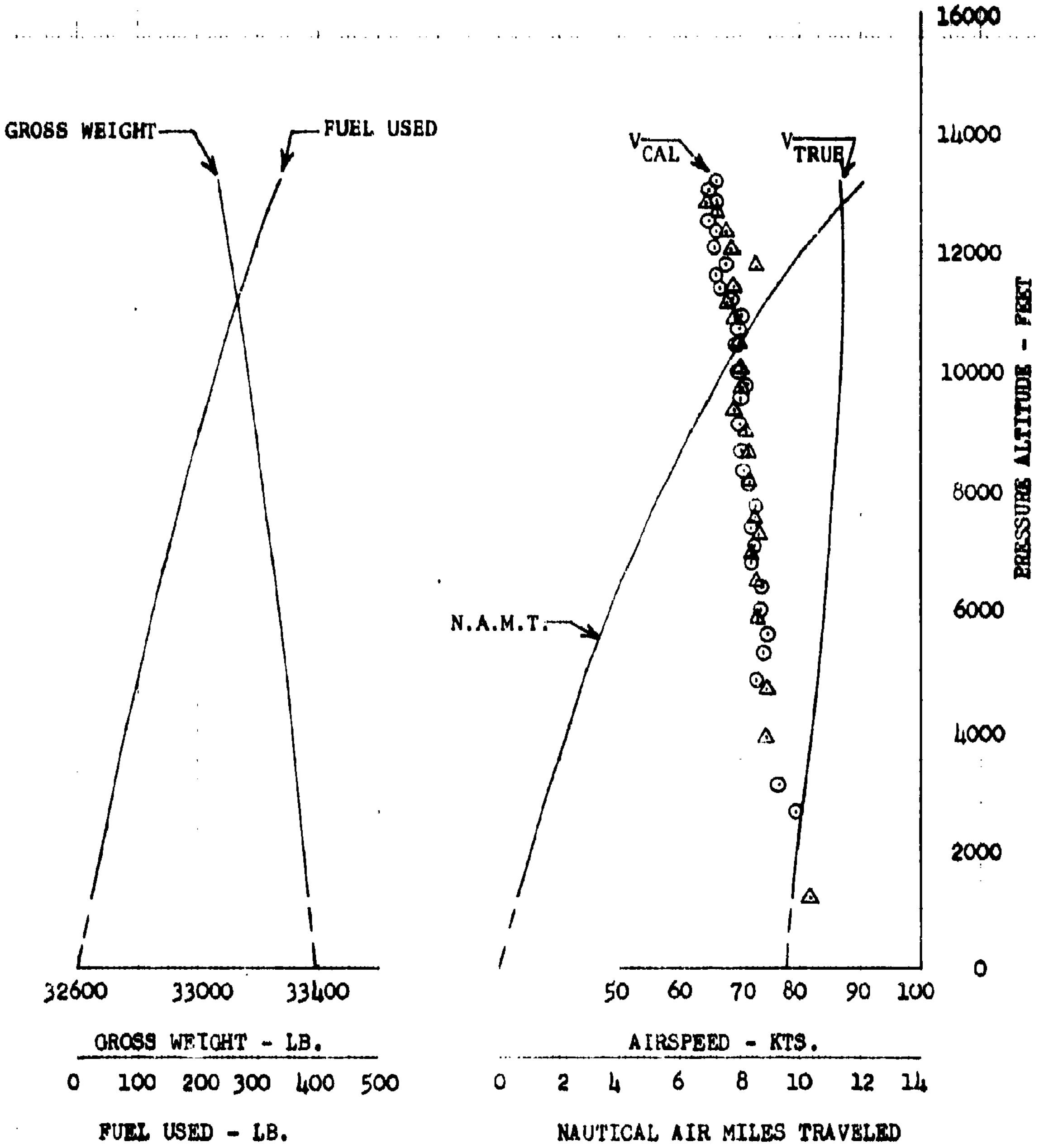


FIGURE NO. 78
CLIMB PERFORMANCE
CH-47B U.S.A. S/N 66-19100
DUAL ENGINE
STANDARD DAY

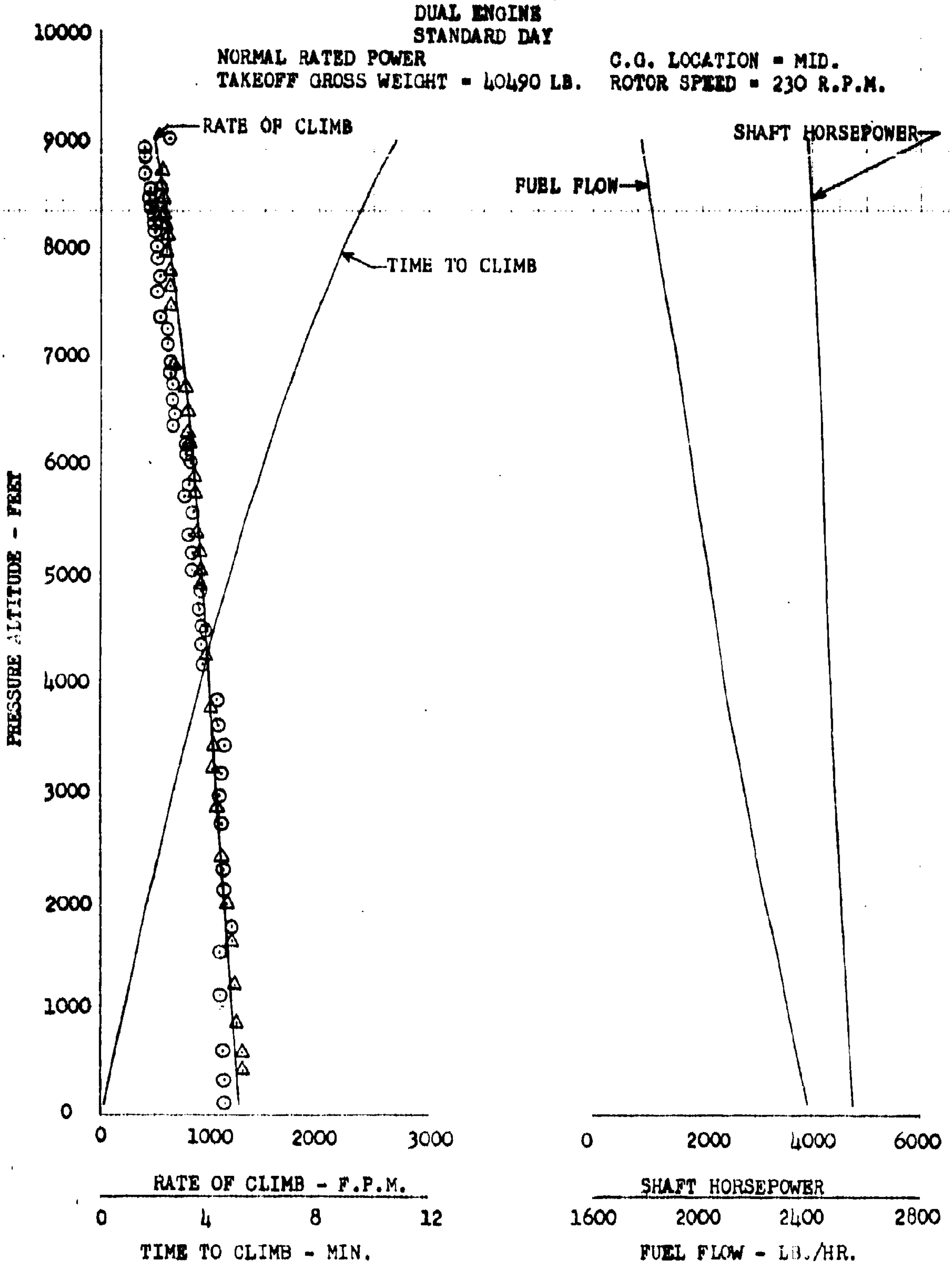


FIGURE NO. 79
CLIMB PERFORMANCE (CONCLUDED)
CH-47B U.S.A. S/N 66-19100

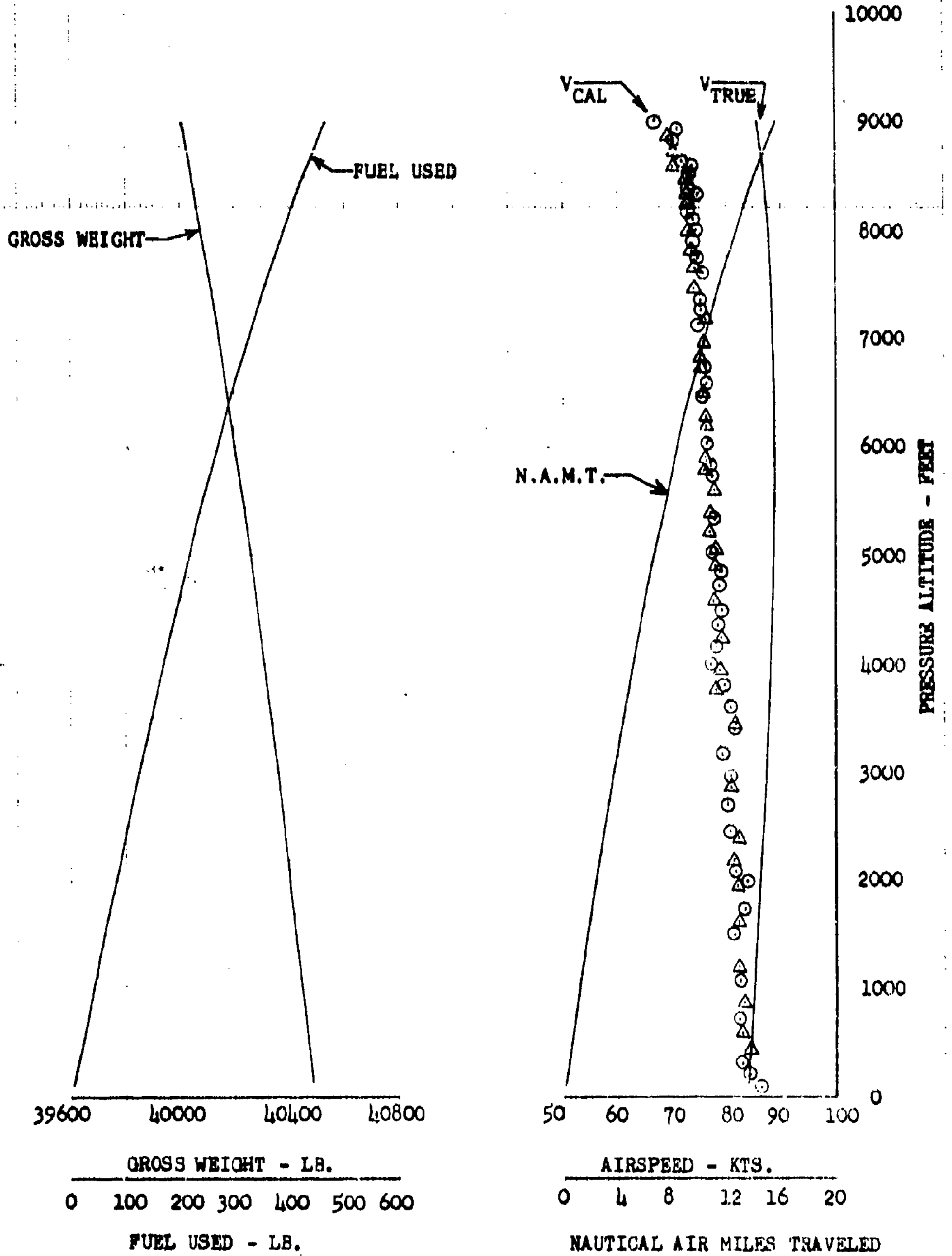


FIGURE NO. 80
CLIMB PERFORMANCE
CH-47B U.S.A. S/N 66-19100
DUAL ENGINE
STANDARD DAY

NORMAL RATED POWER
TAKEOFF GROSS WEIGHT = 27275 LB.

C.G. LOCATION = MID
ROTOR SPEED = 225 R.P.M.

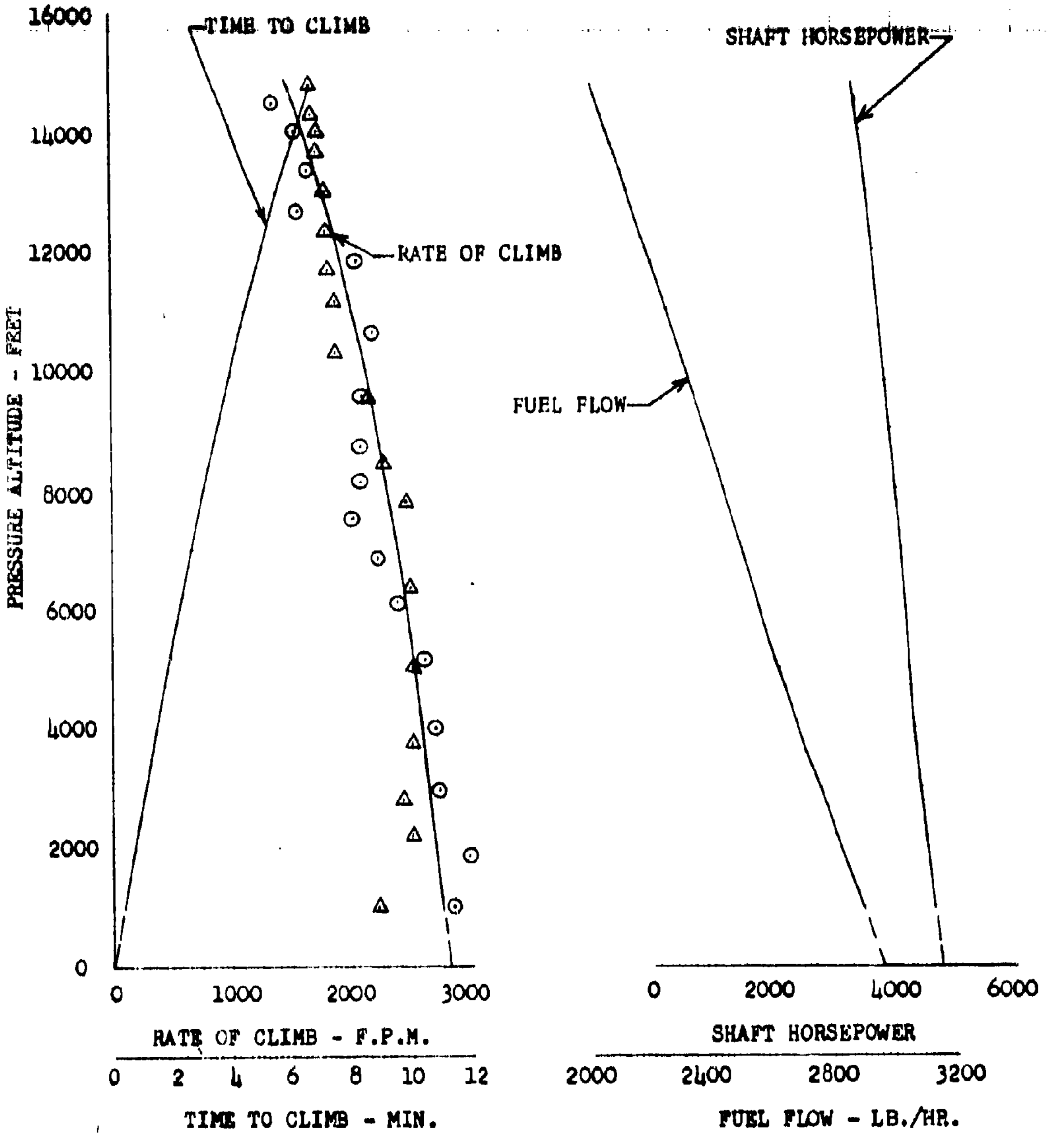


FIGURE NO. 81
CLIMB PERFORMANCE (CONCLUDED)
CH-47B U.S.A. S/N 66-19100

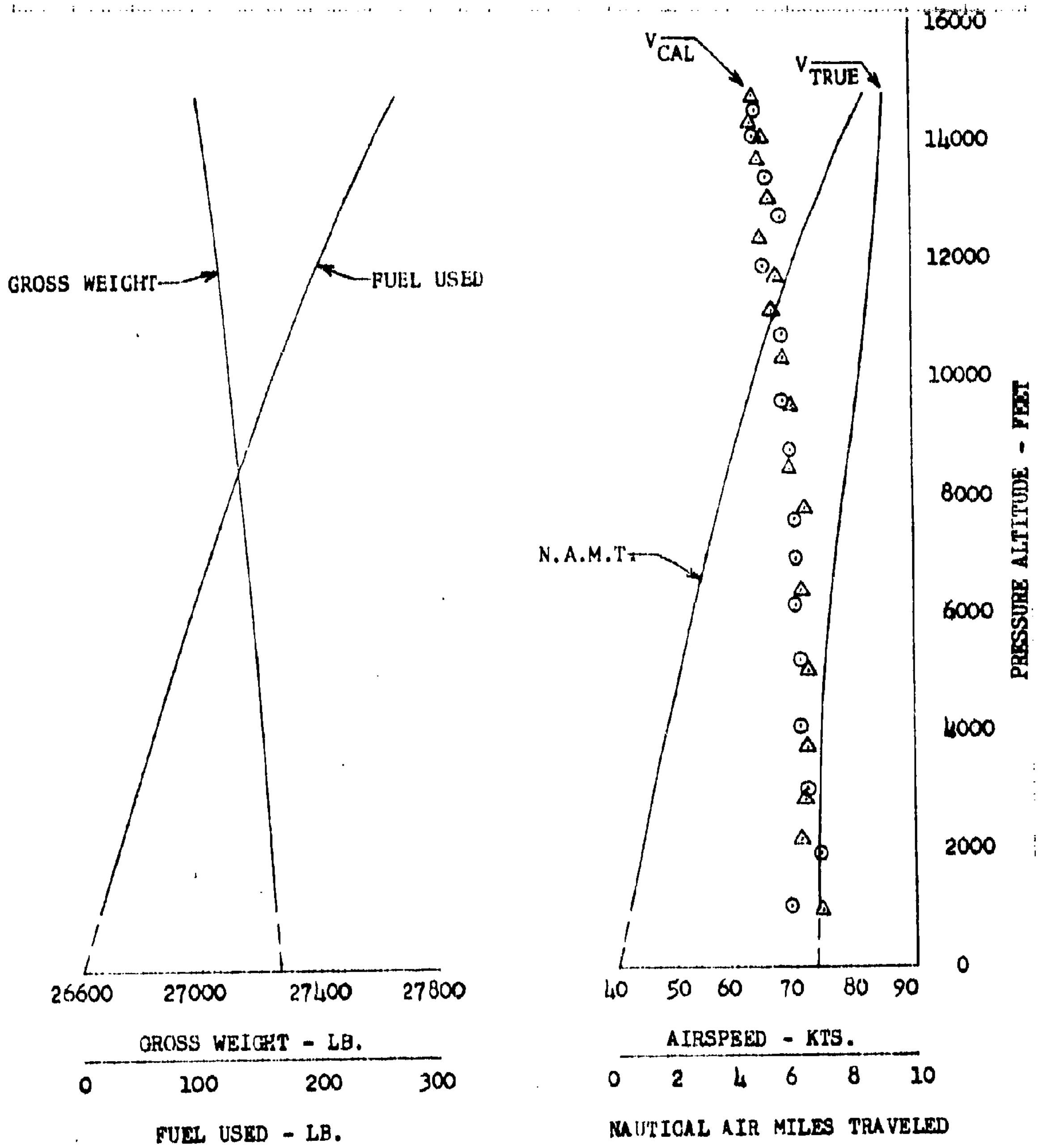


FIGURE NO. 82
POWER CORRECTION FOR CLIMBS
CH-47B U.S.A. S/N 66-19100

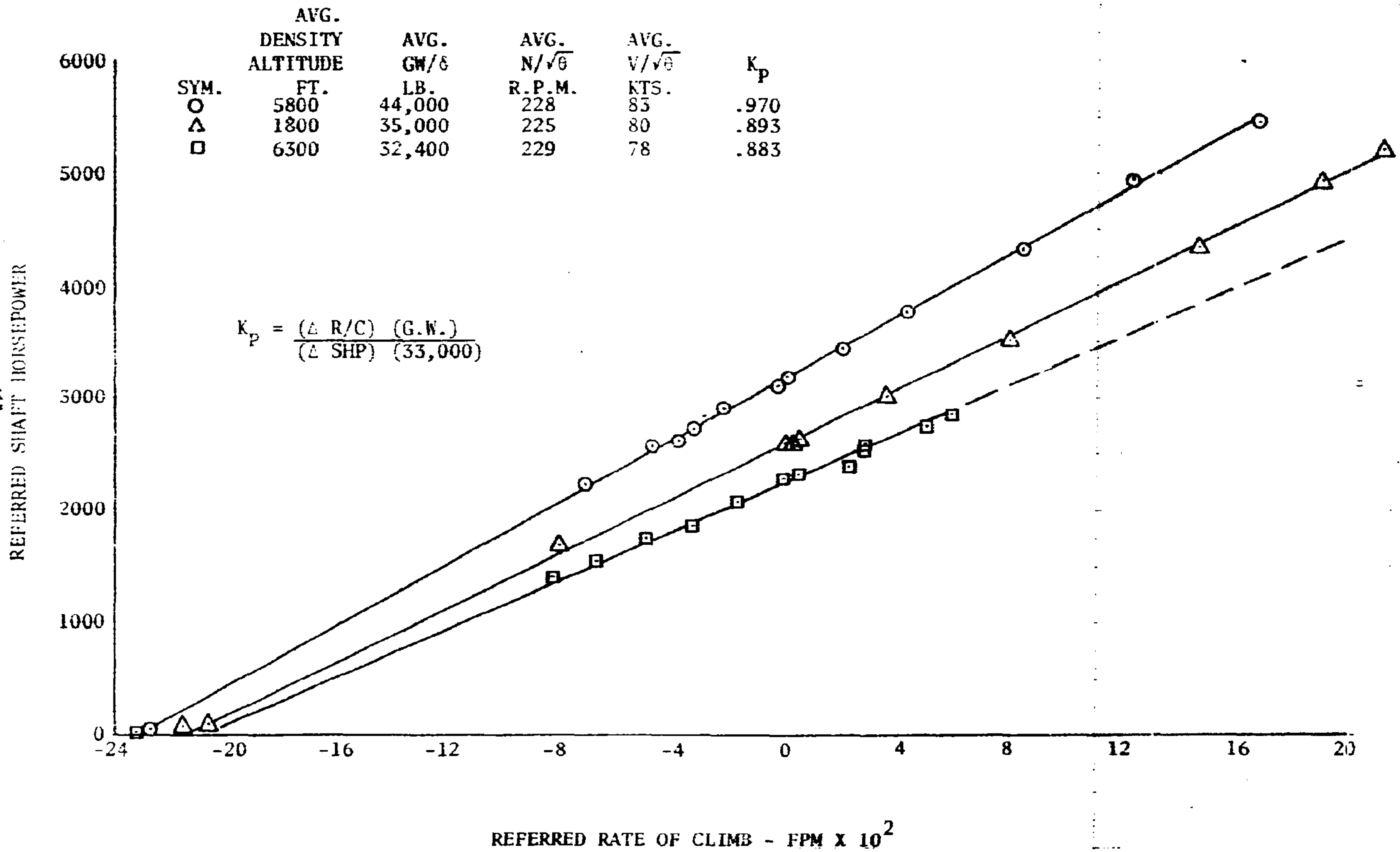


FIGURE NO. 83
WEIGHT CORRECTION FOR CLIMBS
CH-47B USA S/N 66-19100

SYM	AVG. DENSITY ALTITUDE FT.	AVG. ROTOR APEED R.P.M.	AVG. S.H.P.
O	5000	230	4100
Δ	5000	225	4100

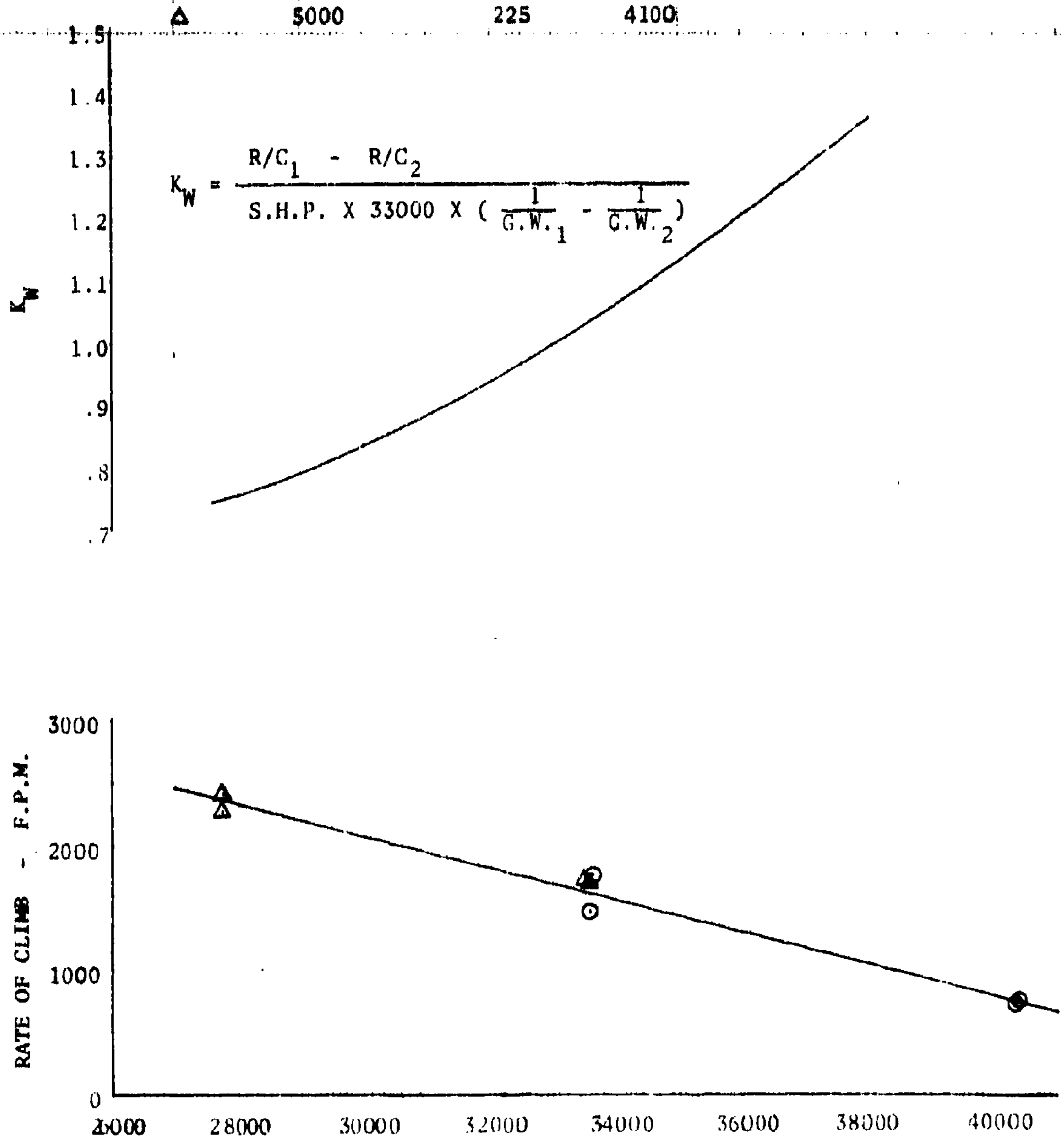


FIGURE NO. 54
GENERALIZED AIRSPEED FOR
MAXIMUM GLIDE DISTANCE
CH-47B U.S.A. S/N 66-19100

NOTE: DATA DERIVED FROM FIGURES 39 THROUGH 50.

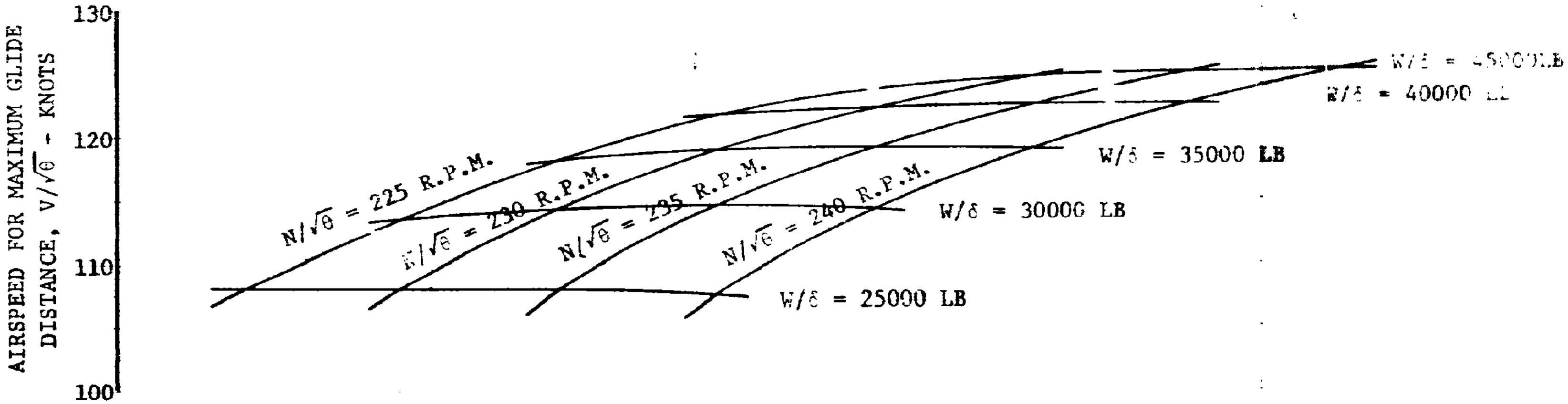


FIGURE NO. 85
GENERALIZED AIRSPEED FOR MAXIMUM RATE
OF CLIMB AND MINIMUM RATE OF DESCENT
CH-47B U.S.A. S/N 66-19100

NOTE: CURVES DERIVED FROM FIGURES 39 **THROUGH** 50.

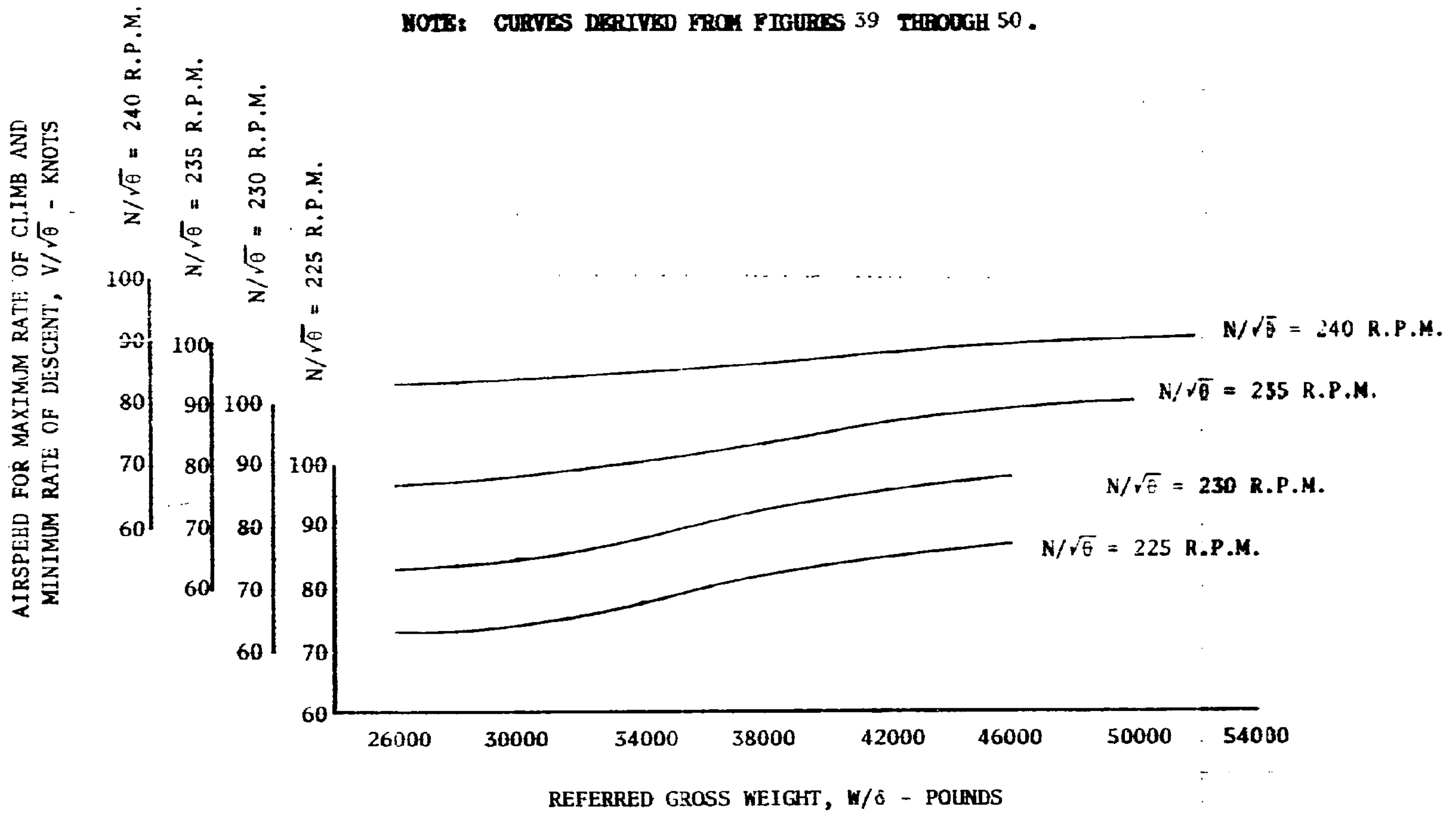
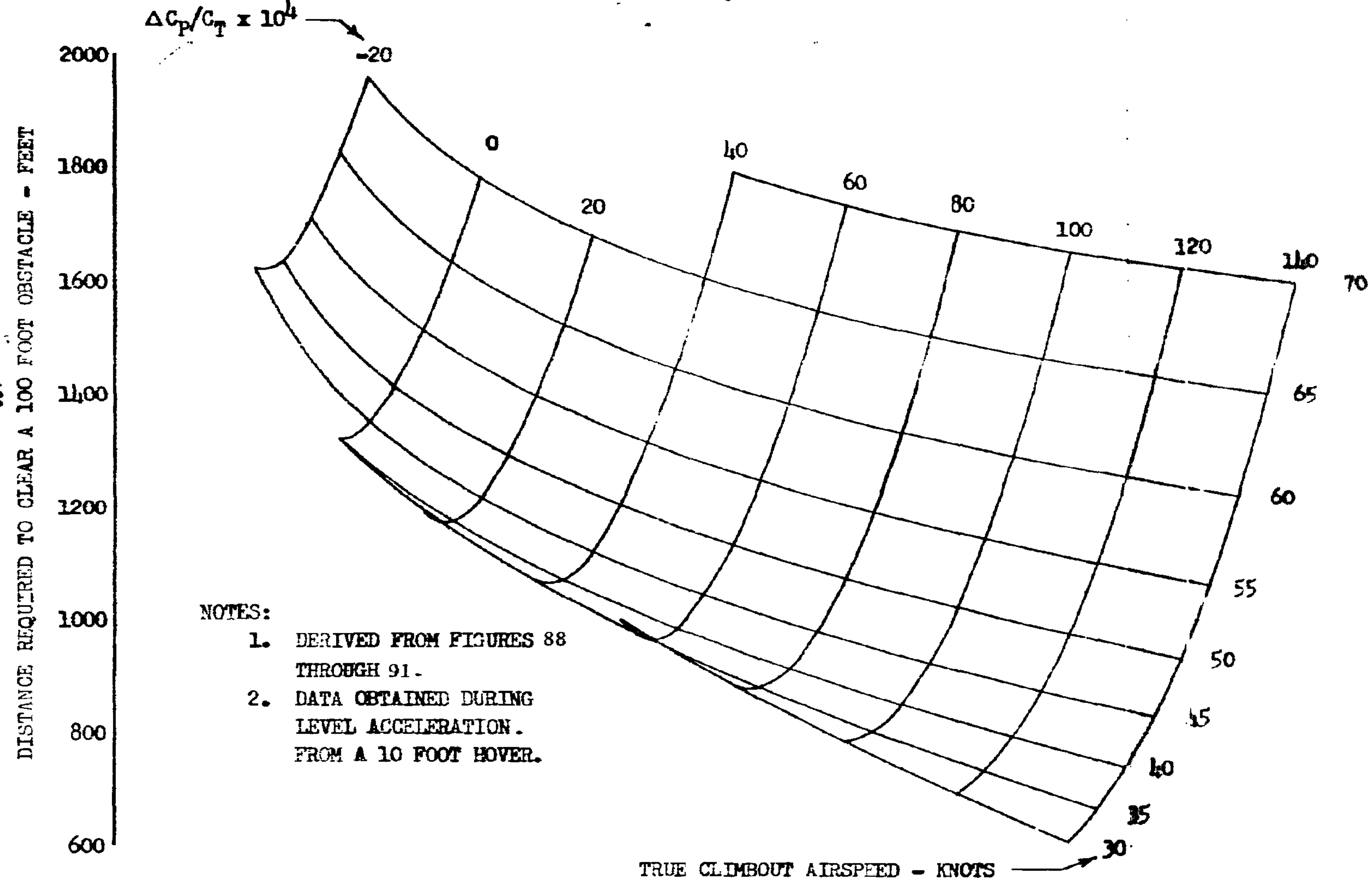


FIGURE NO. 86
TAKEOFF PERFORMANCE
CH-47B U.S.A. S/N 66-19100
ROTOR SPEED = 230 R.P.M.



NOTES:
1. DERIVED FROM FIGURES 88 THROUGH 91.
2. DATA OBTAINED DURING LEVEL ACCELERATION. FROM A 10 FOOT HOVER.

FIGURE NO. 87
TAKEOFF PERFORMANCE
CH-47B U.S.A. S/N 66-19100
ROTOR SPEED = 230 R.P.M.

NOTES:
1. DERIVED FROM FIGURES 88 THROUGH 91.
2. DATA OBTAINED DURING LEVEL ACCELERATION FROM A 10 FOOT HOVER.

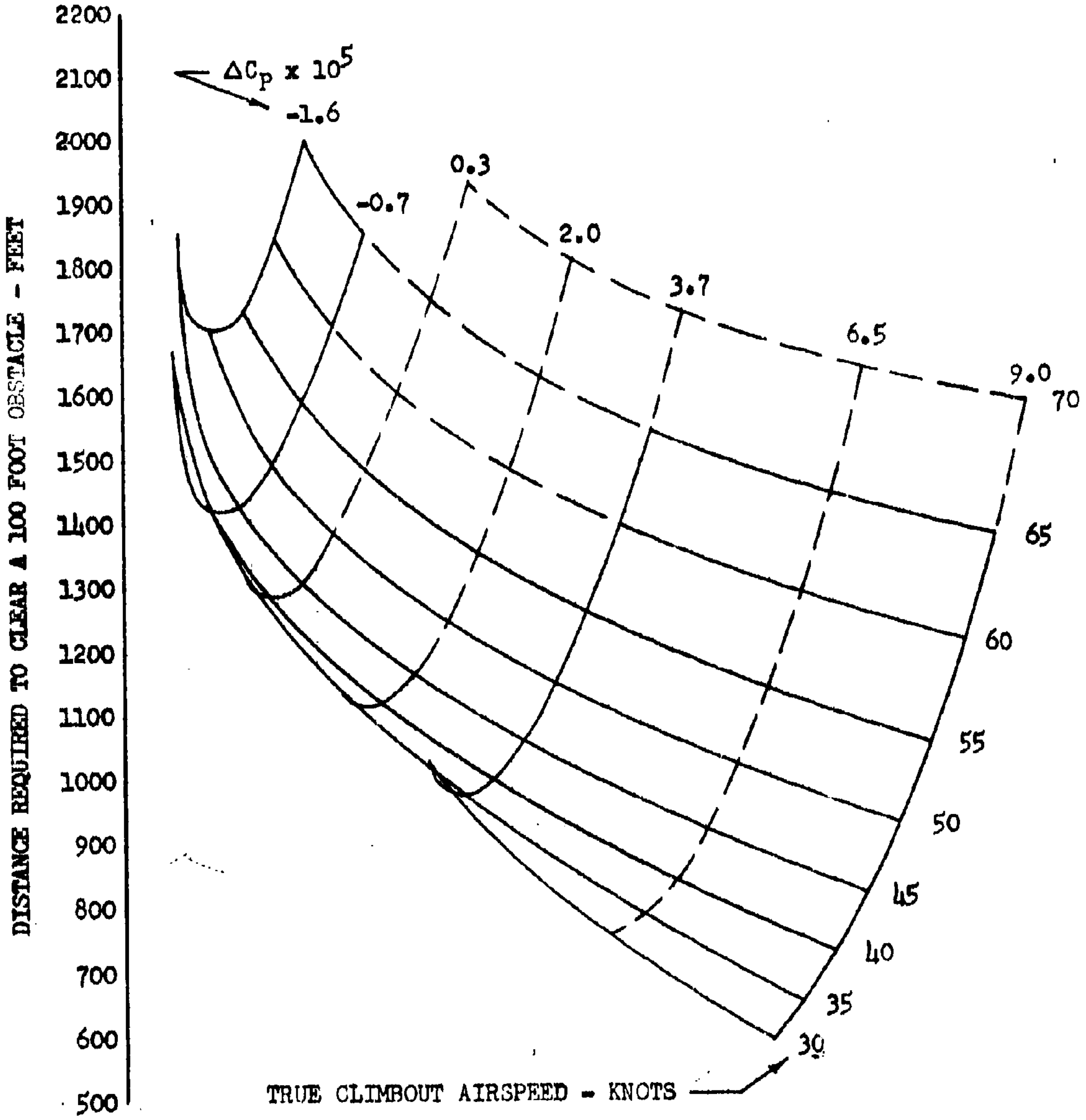


FIGURE NO. [illegible]
TAKEOFF [illegible]
[illegible]47B U.S. [illegible] S/N [illegible]6-19100

AVG. GROSS WEIGHT LB.	AVG. PRESSURE ALTITUDE FT.	AVG. OAT °C	AVG. ROTOR SPEED R.P.M.	AVG. C.G. IN.	AVG. ΔC_p $x10^5$	AVG. $\Delta C_p/C_p$ $x10^4$
38000	9560	-0.7	230	330.3	-1.6	-22

NOTES:

1. DATA OBTAINED DURING LEVEL ACCELERATION FROM A 10 FOOT HOVER.
2. DUAL ENGINE.
3. MAXIMUM POWER.

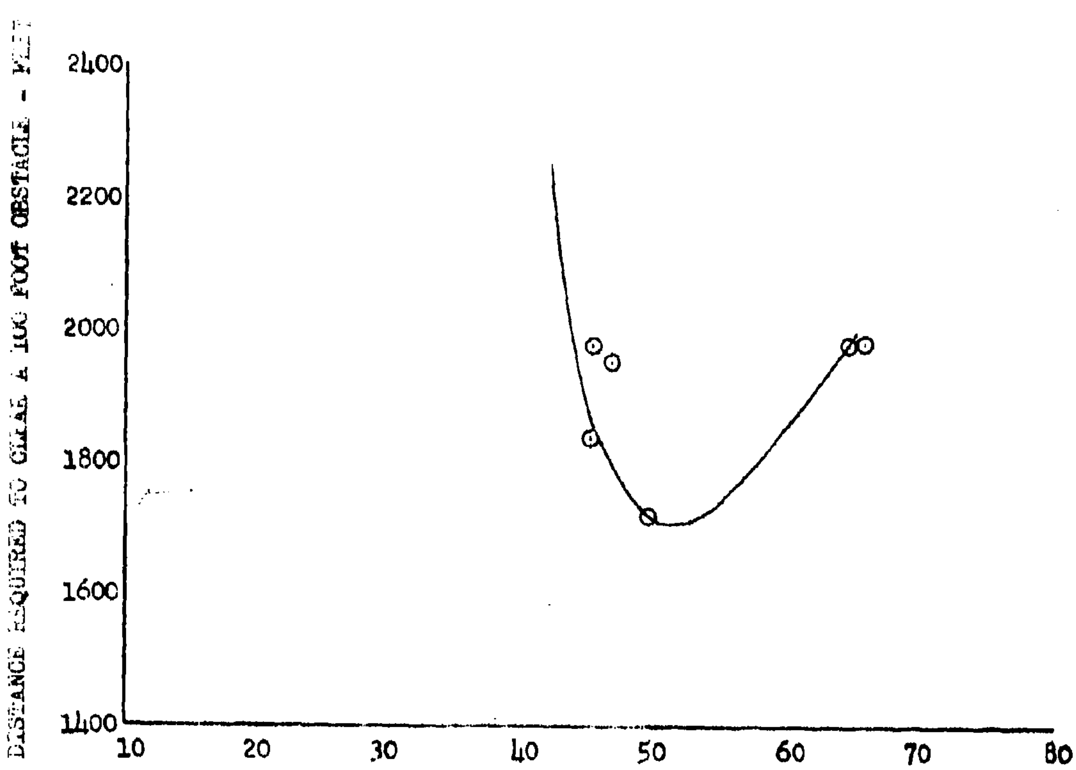


FIGURE [illegible]
TAKEOFF PERFORMANCE
CH-47B U.S.A. S/N 66-19100

AVG. GROSS WEIGHT LB.	AVG. PRESSURE ALTITUDE FT.	AVG. OAT °C	AVG. ROTOR SPEED R.P.M.	AVG. C.G. IN.	AVG. ΔC_P $x10^5$	AVG. $\Delta C_P/C_T$ $x10^4$
35300	9560	13.6	230	331.2	-0.7	-10

NOTES:

1. DATA OBTAINED DURING LEVEL ACCELERATION FROM A 10 FOOT HOVER.
2. DUAL ENGINE.
3. MAXIMUM POWER.

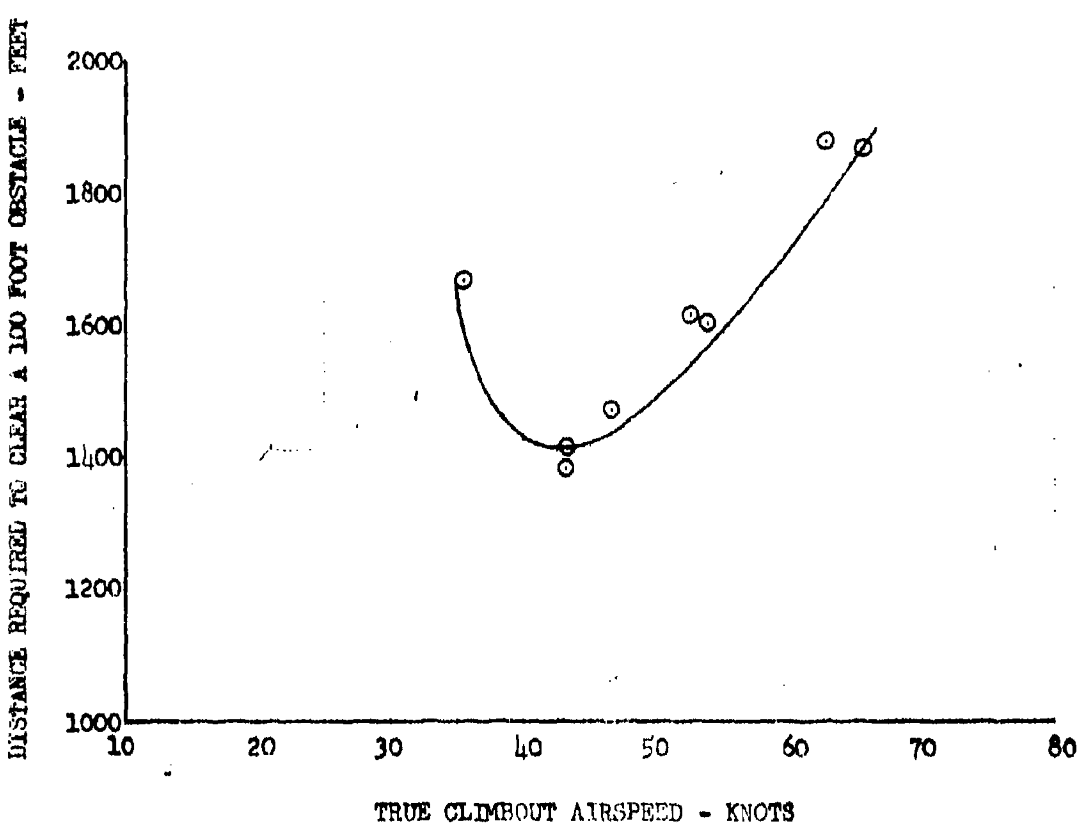


FIGURE NO. 90

TAKEOFF PERFORMANCE

CH-47B U.S.A. S/N 66-19100

AVG. GROSS WEIGHT LB.	AVG. PRESSURE ALTITUDE FT.	AVG. OAT °C	AVG. ROTOR SPEED R.P.M.	AVG. C.G. IN.	AVG. ΔC_P $x10^5$	AVG. $\Delta C_P/C_T$ $x10^4$
34100	9560	5.8	230	332.1	3.7	56

NOTES:

1. DATA OBTAINED DURING LEVEL ACCELERATION FROM A 10 FOOT HOVER.
2. DUAL ENGINE.
3. MAXIMUM POWER.

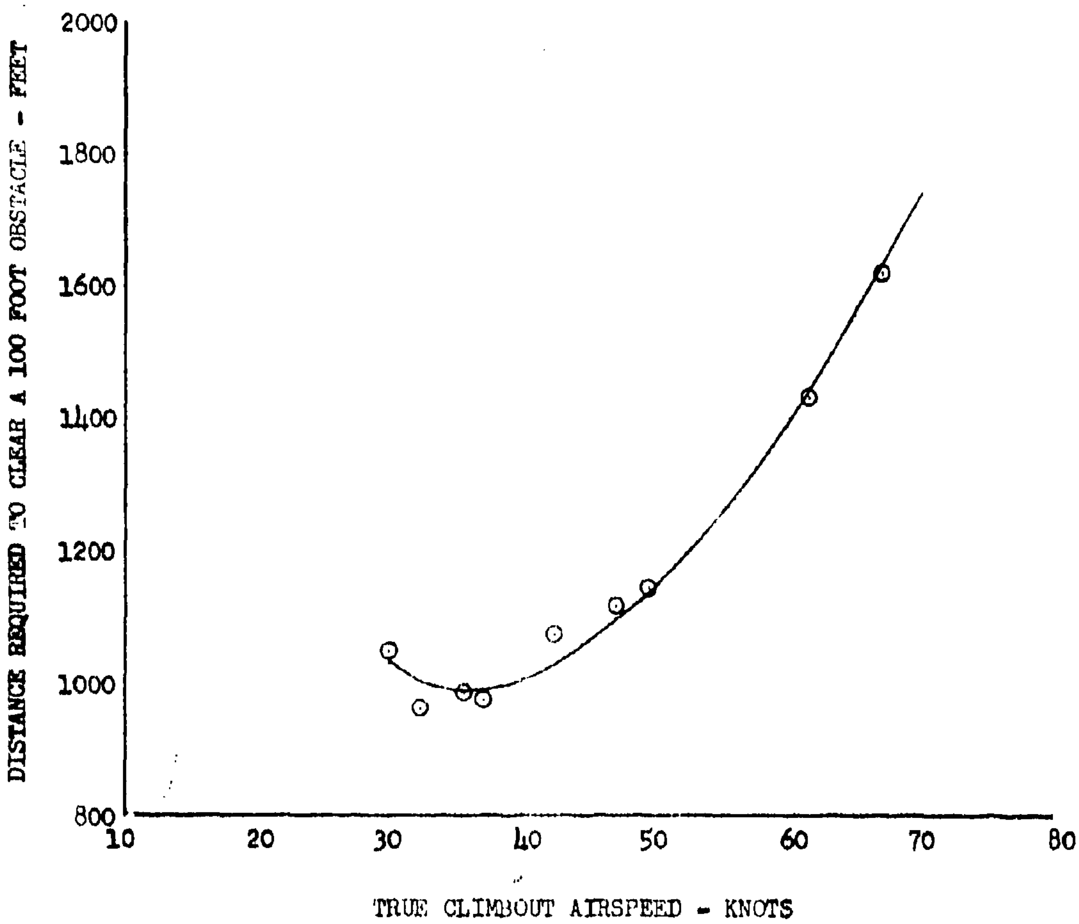


FIGURE NO. 91

TAKEOFF PERFORMANCE

CH-47B U.S.A. S/N 66-19100

AVG. GROSS WEIGHT LB.	AVG. PRESSURE ALTITUDE FT.	AVG. OAT °C	AVG. ROTOR SPEED R.P.M.	AVG. C.G. IN.	AVG. ΔC_p $\times 10^5$	AVG. $\Delta C_p/C_T$ $\times 10^4$
32090	9560	8.2	230	330.2	9.0	141

NOTES:

1. DATA OBTAINED DURING LEVEL ACCELERATION FROM A 10 FOOT HOVER.
2. DUAL ENGINE.
3. MAXIMUM POWER.

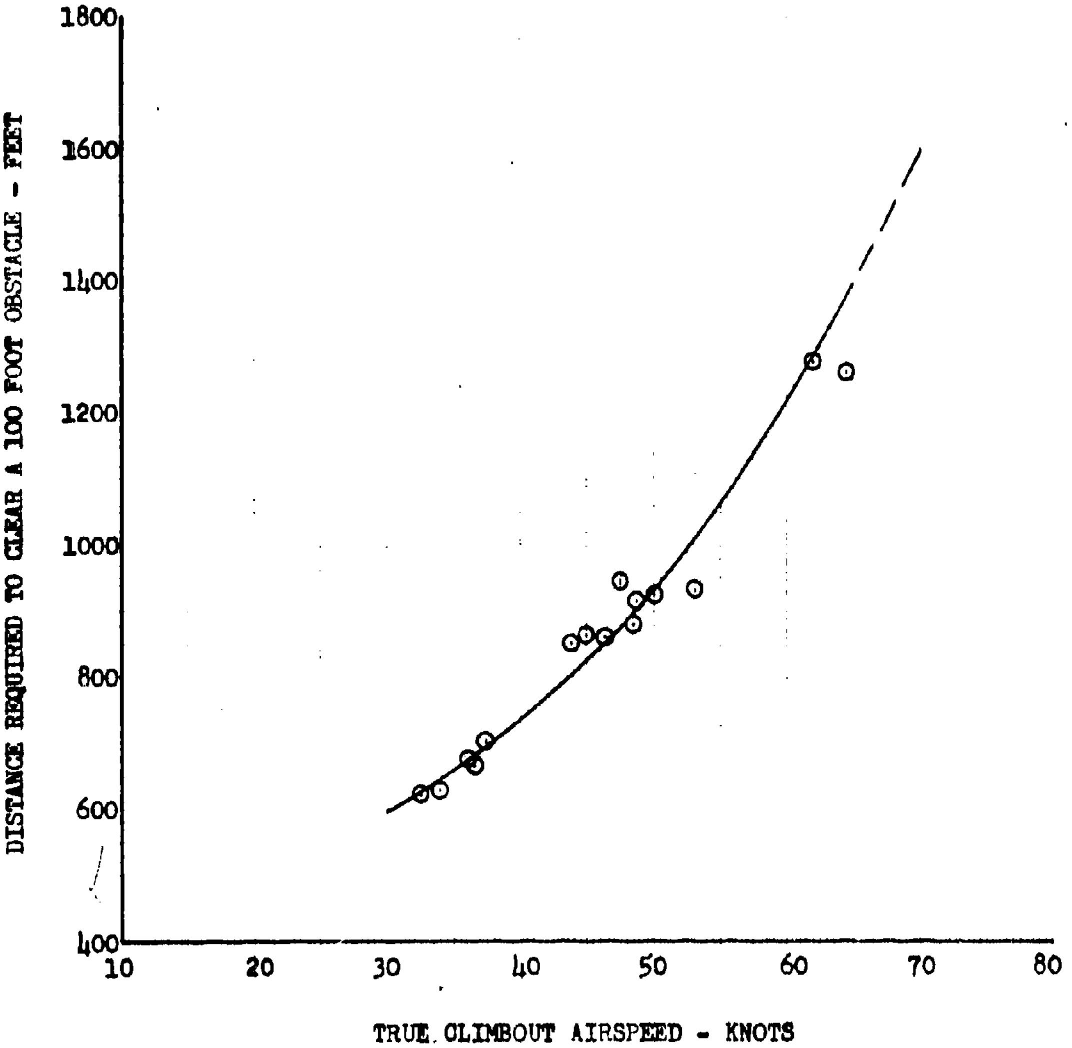
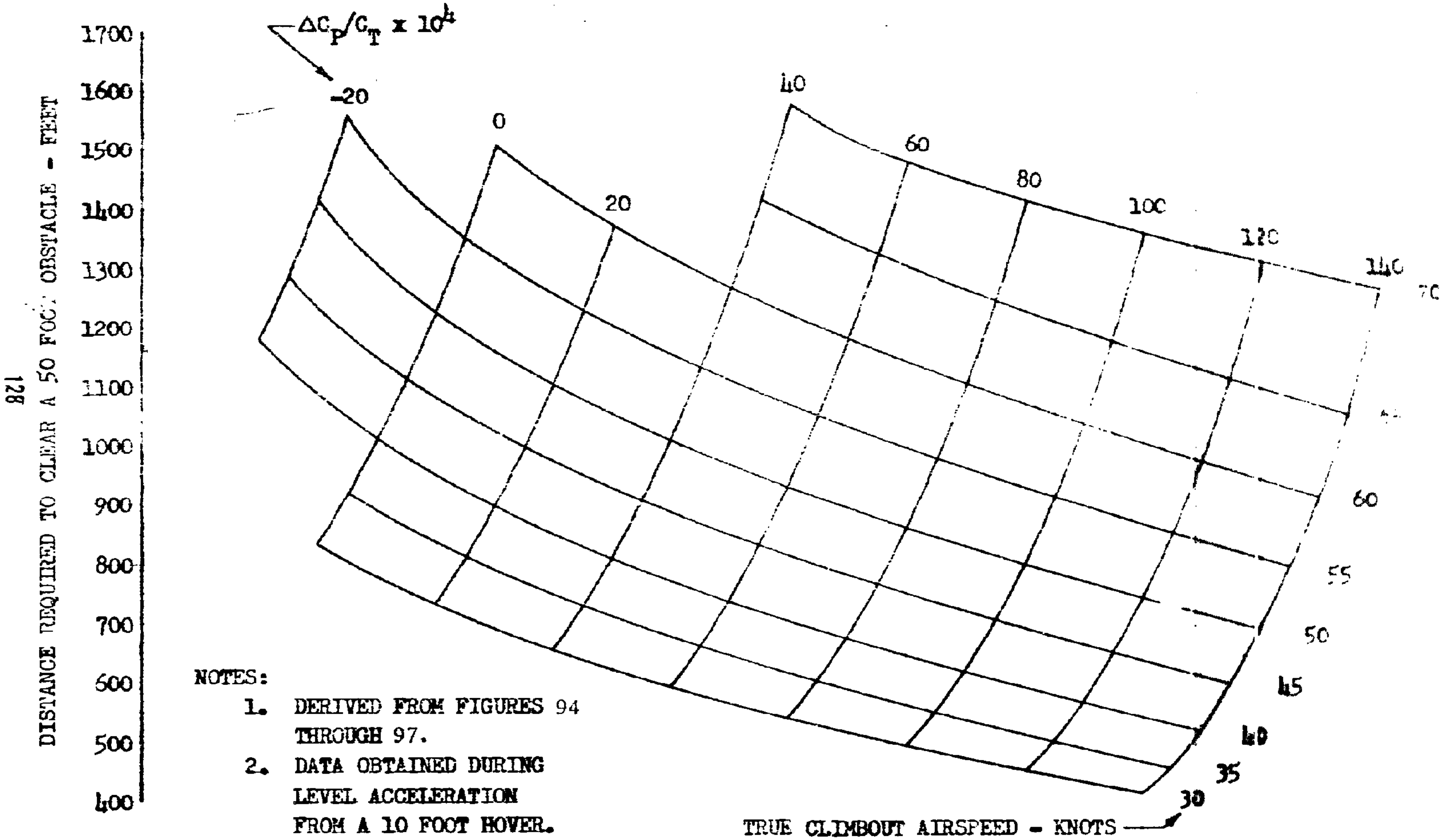


FIGURE [illegible]

TAKEOFF PERFORMANCE

CH-47B U.S.A. S/N 66-19100

ROTOR SPEED = 230 R.P.M.



NOTES:

1. DERIVED FROM FIGURES 94 THROUGH 97.
2. DATA OBTAINED DURING LEVEL ACCELERATION FROM A 10 FOOT HOVER.

FIGURE NO. [illegible]
TAKEOFF PERFORMANCE
CH-47B U.S.A. S/N [illegible]
ROTOR SPEED = 230 R.P.M.

NOTES:
1. DERIVED FROM FIGURES 94 THROUGH 97.
2. DATA OBTAINED DURING LEVEL ACCELERATION FROM A 10 FOOT HOVER.

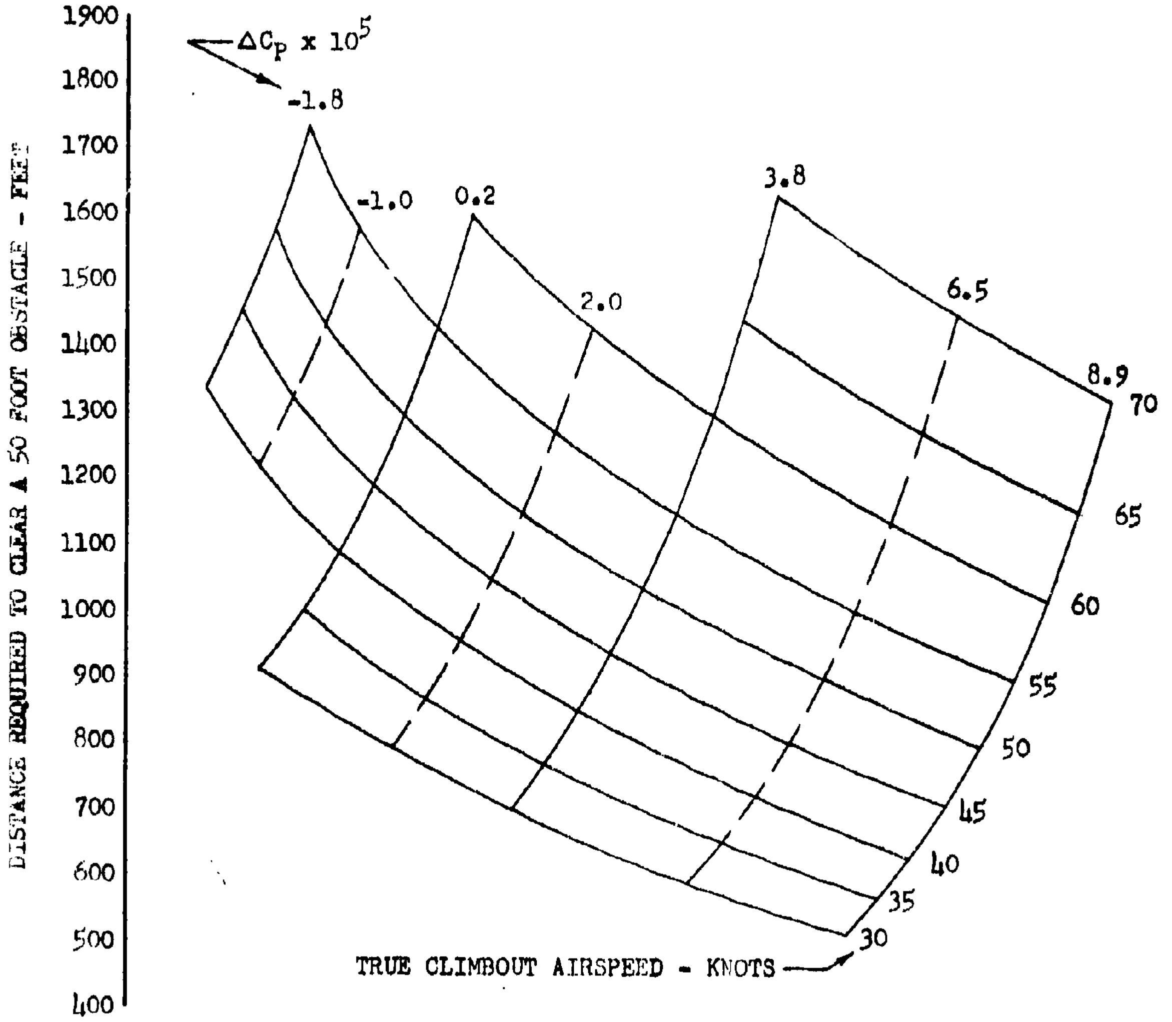


FIGURE NO. 94
TAKEOFF PERFORMANCE
CH-47B U.S.A. S/N 66-19100

AVG. GROSS WEIGHT LB.	AVG. PRESSURE ALTITUDE FT.	AVG. OAT °C	AVG. ROTOR SPEED R.P.M.	AVG. C.G. IN.	AVG. ΔC_P	AVG. $\Delta C_P/C_T$
38000	9510	-0.7	230	330.3	$-1.8x10^{-5}$	$-25x10^{-4}$

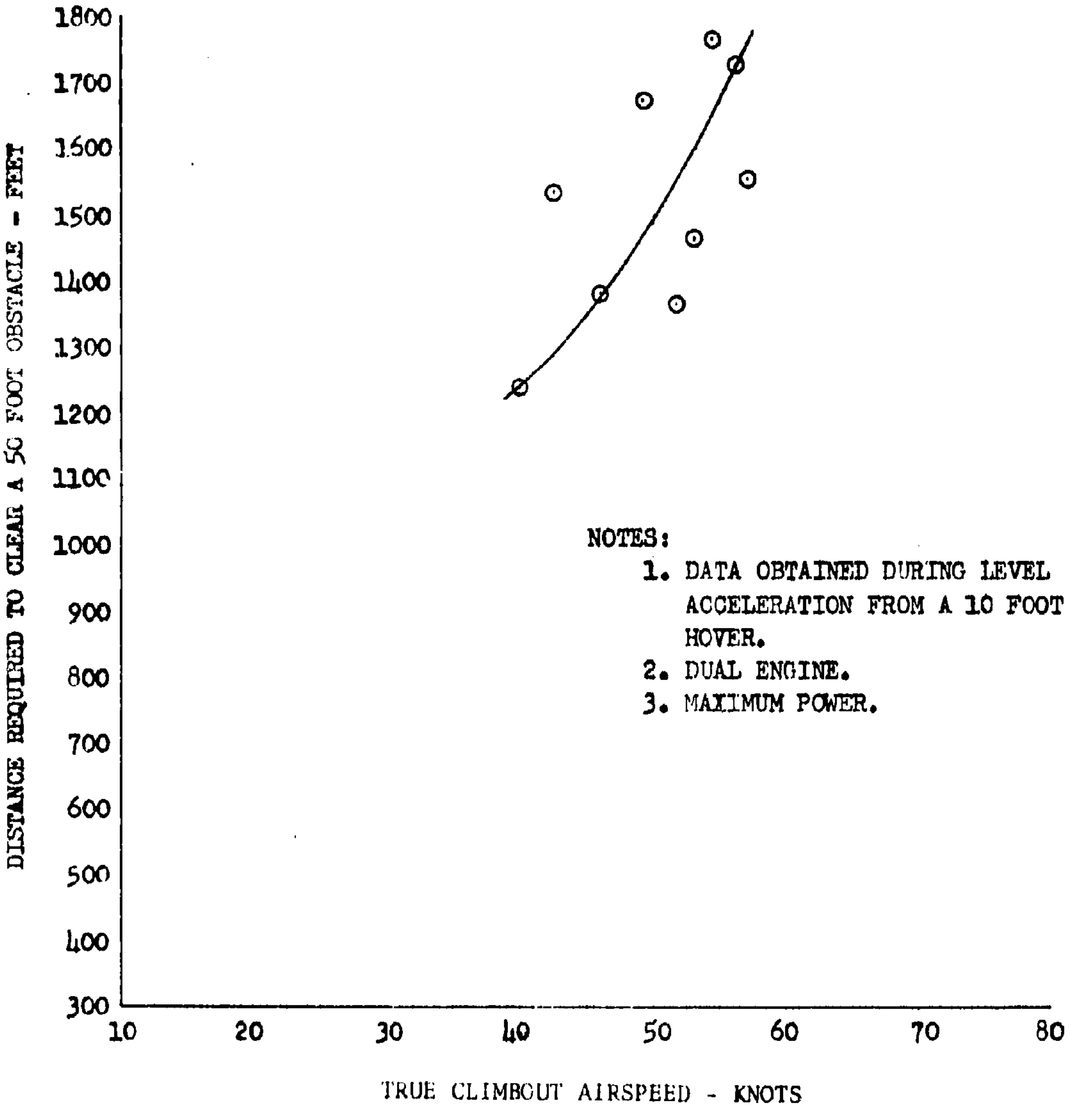


FIGURE NO. 95
TAKEOFF PERFORMANCE
CH-47B U.S.A. S/N 66-19100

AVG. GROSS WEIGHT LB.	AVG. PRESSURE ALTITUDE FT.	AVG. OAT °C	AVG. ROTOR SPEED R.P.M.	AVG. C.G. IN.	AVG. ΔC_P $x10^5$	AVG. $\Delta C_P/C_T$ $x10^4$
35300	9510	13.6	230	331.2	0.2	2.8

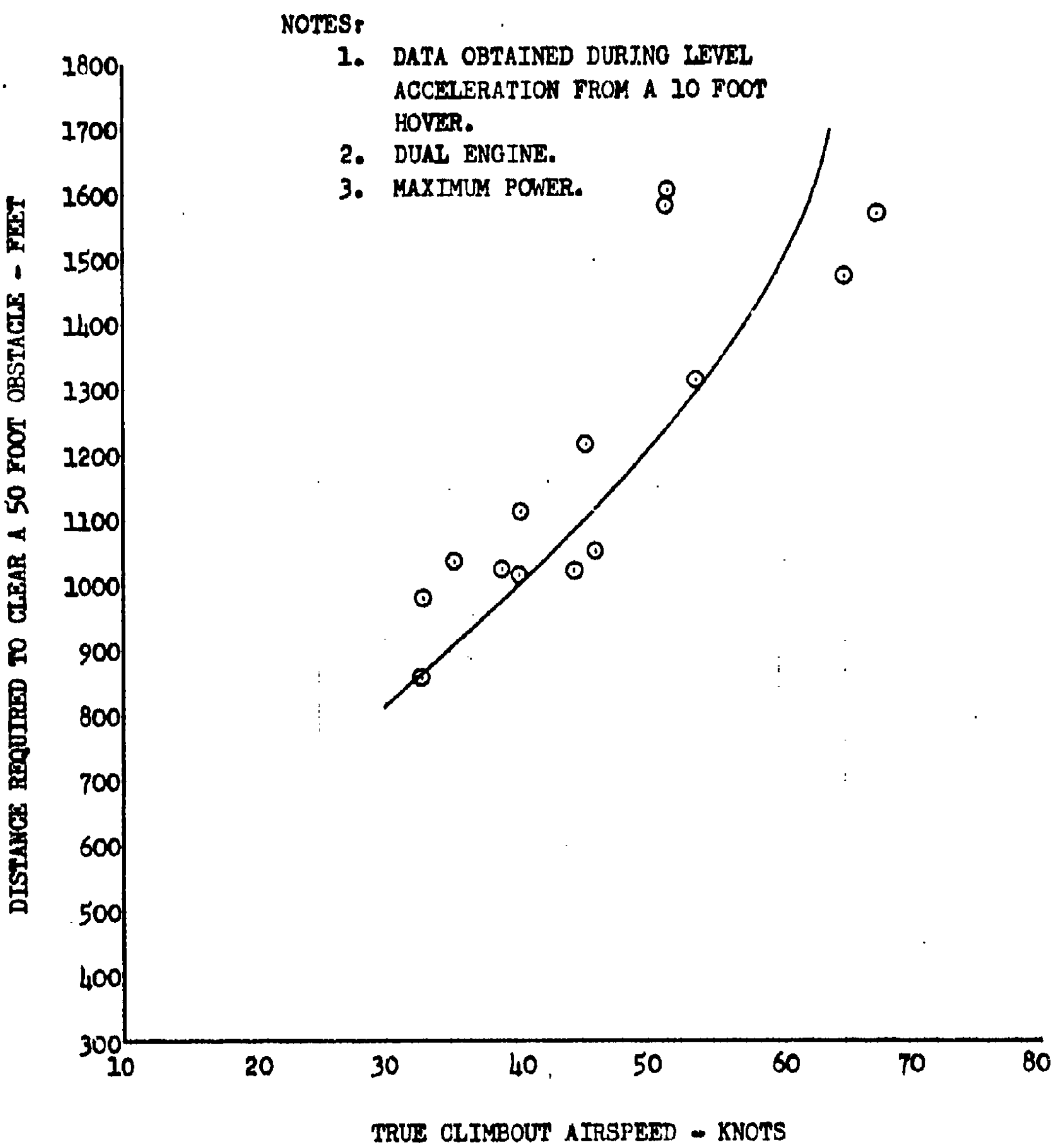


FIGURE NO. 96
TAKEOFF PERFORMANCE
CH-47B U.S.A. S/N 66-19100

AVG. GROSS WEIGHT	AVG. PRESSURE ALTITUDE	AVG. OAT	AVG. ROTOR SPEED	AVG. C.G.	AVG. ΔC_P	AVG. $\Delta C_P/C_T$
LB.	FT.	°C	R.P.M.	IN.	$x10^5$	$x10^4$
34100	9510	5.8	230	332.1	3.8	58

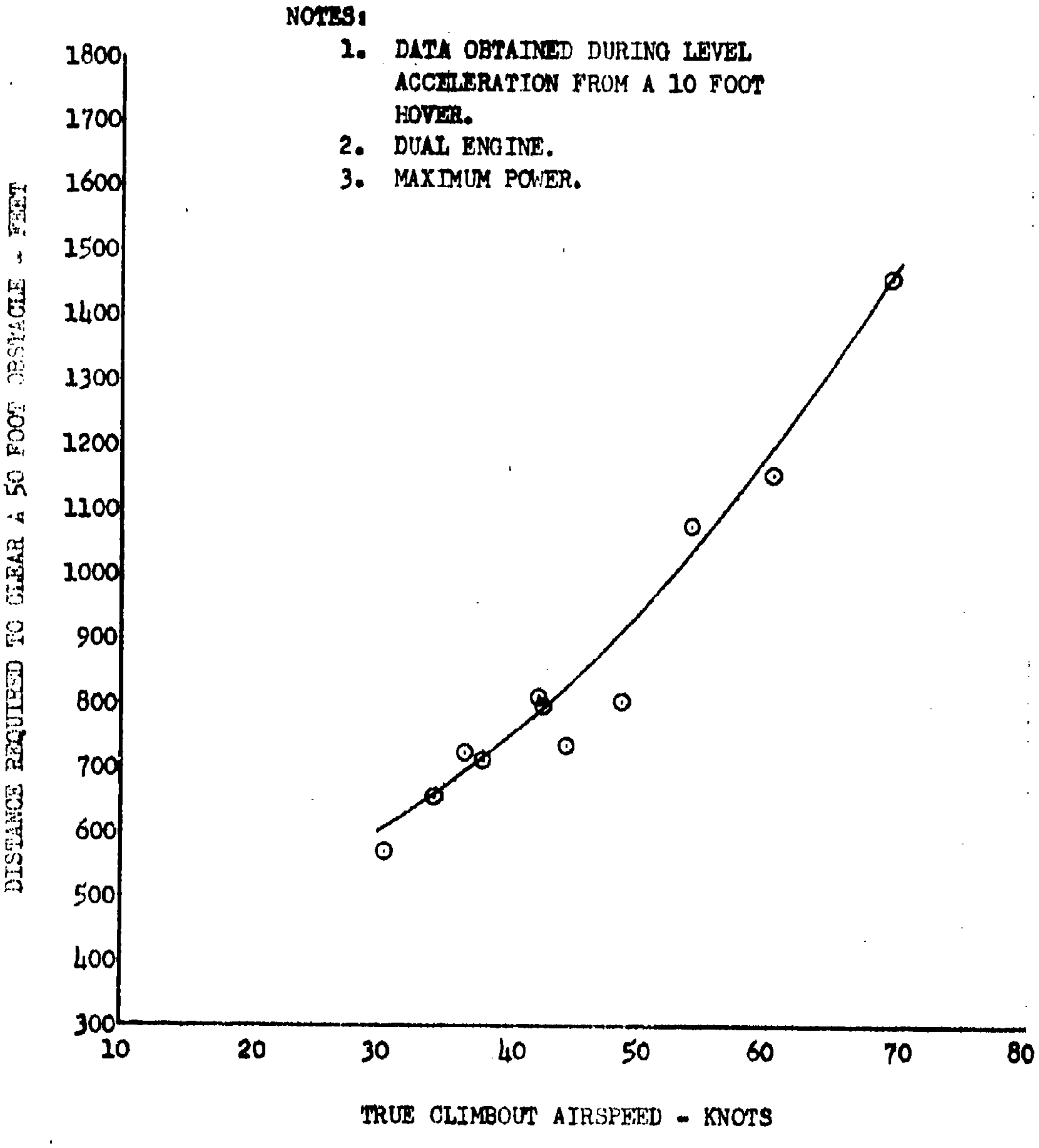


FIGURE NO. 97
TAKEOFF PERFORMANCE
CH-47B U.S.A. S/N 66-19100

AVG. GROSS WEIGHT LB.	AVG. PRESSURE ALTITUDE FT.	AVG. OAT °C	AVG. ROTOR SPEED R.P.M.	AVG. C.G. IN.	AVG. ΔC_P $\times 10^5$	AVG. $\Delta C_P/C_T$ $\times 10^4$
32090	9510	8.2	230	330.2	8.9	140

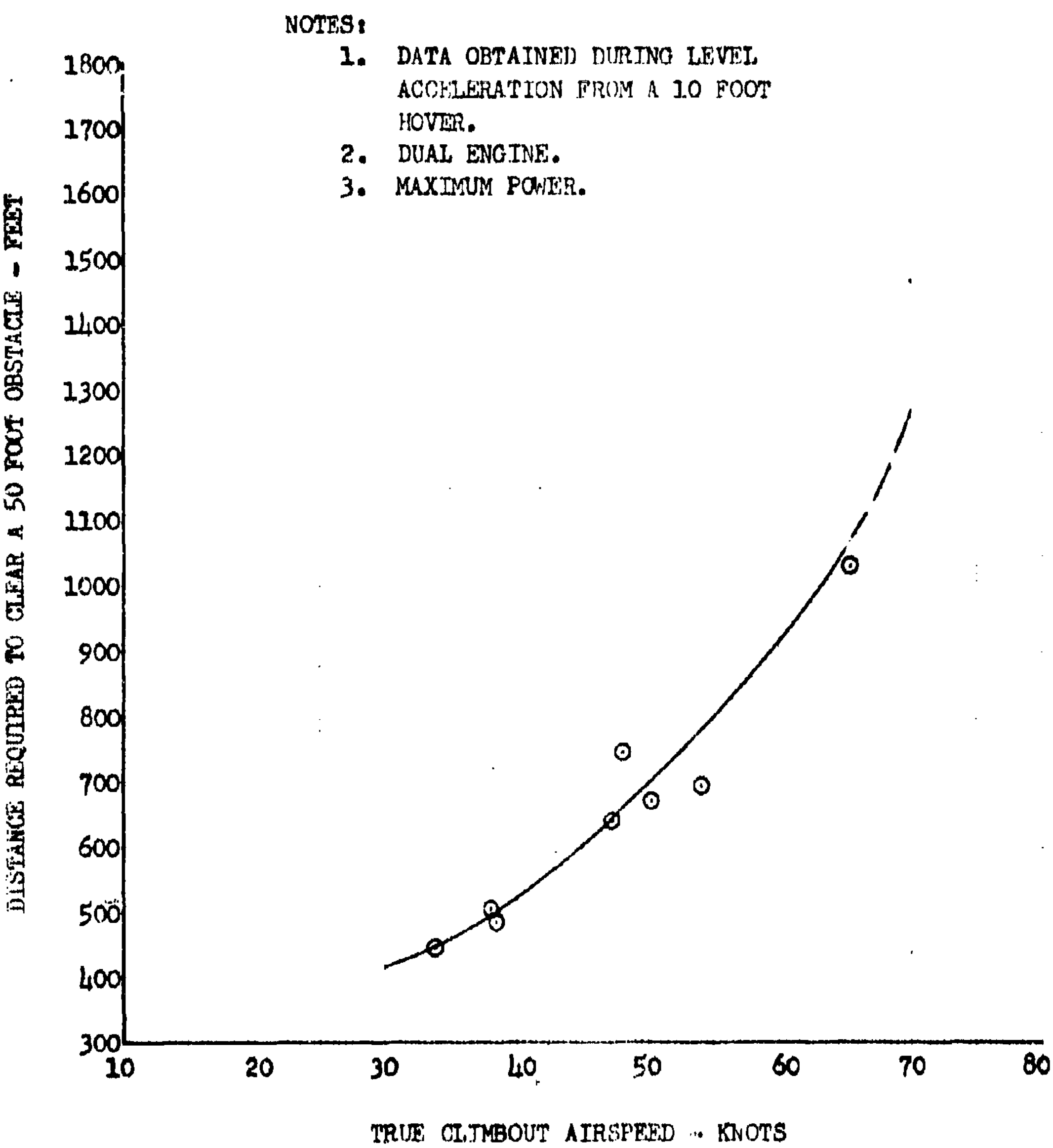


FIGURE NO. 98
LONGITUDINAL STICK POSITION VS. FORCE
CH-47B U.S.A. S/N 66-19100

NOTE:
1. Full longitudinal control travel = 13.0 IN.
2. Test conducted on ground with APU supplying pressure.
3. Shaded symbol indicates trim position.
4. Maximum and minimum gradients as per MIL-H-8501-A.
5. Crosshatch lines indicate limits.

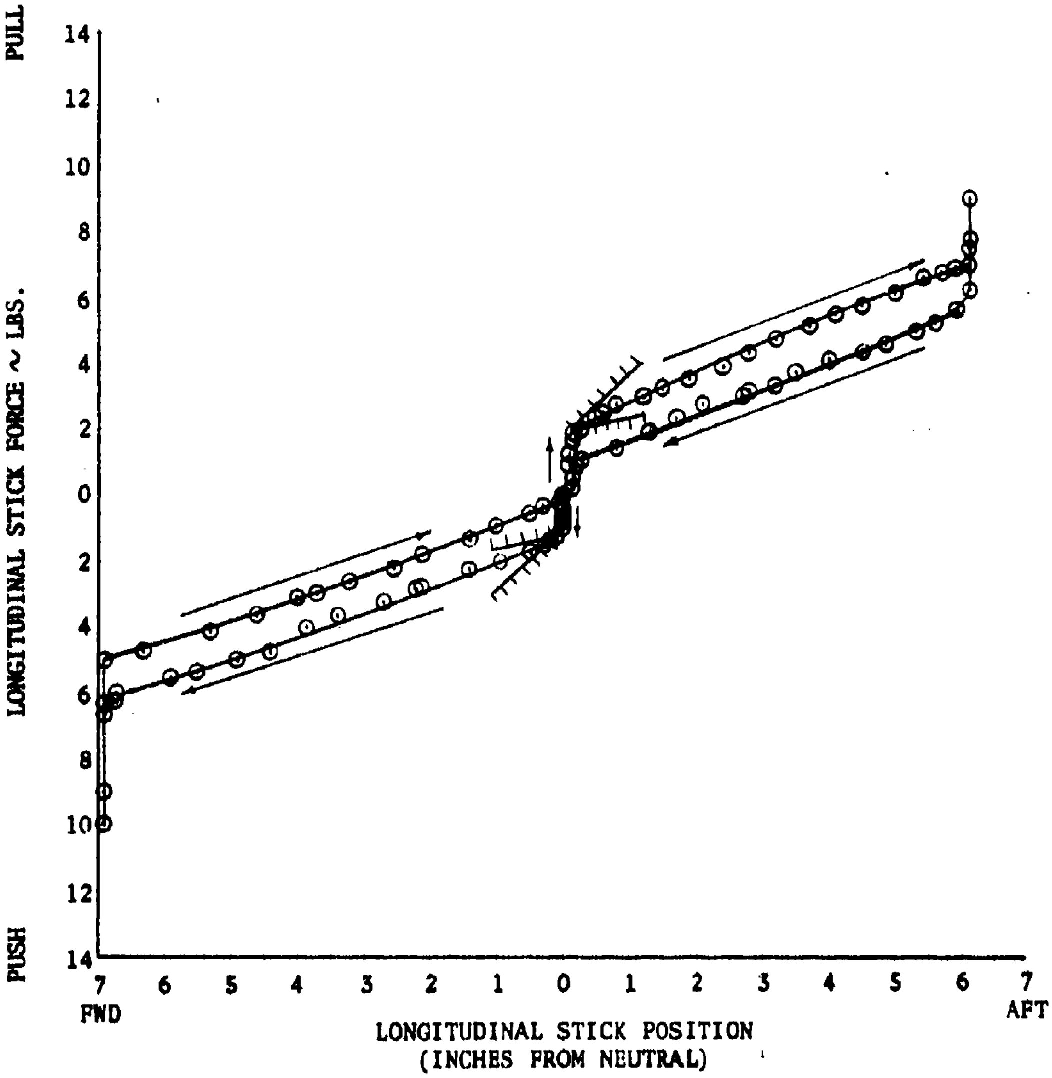


FIGURE NO. 99
LATERAL STICK POSITION VS. FORCE
CH-47B U.S.A. S/N 66-19100

NOTE: 1. Full lateral control travel = 8,45 IN.
2. Test conducted on ground with APU supplying pressure.
3. Shaded symbol indicates trim position.
4. Maximum and minimum gradients as per MIL-H-8501-A.
5. Crosshatch lines indicate limits.

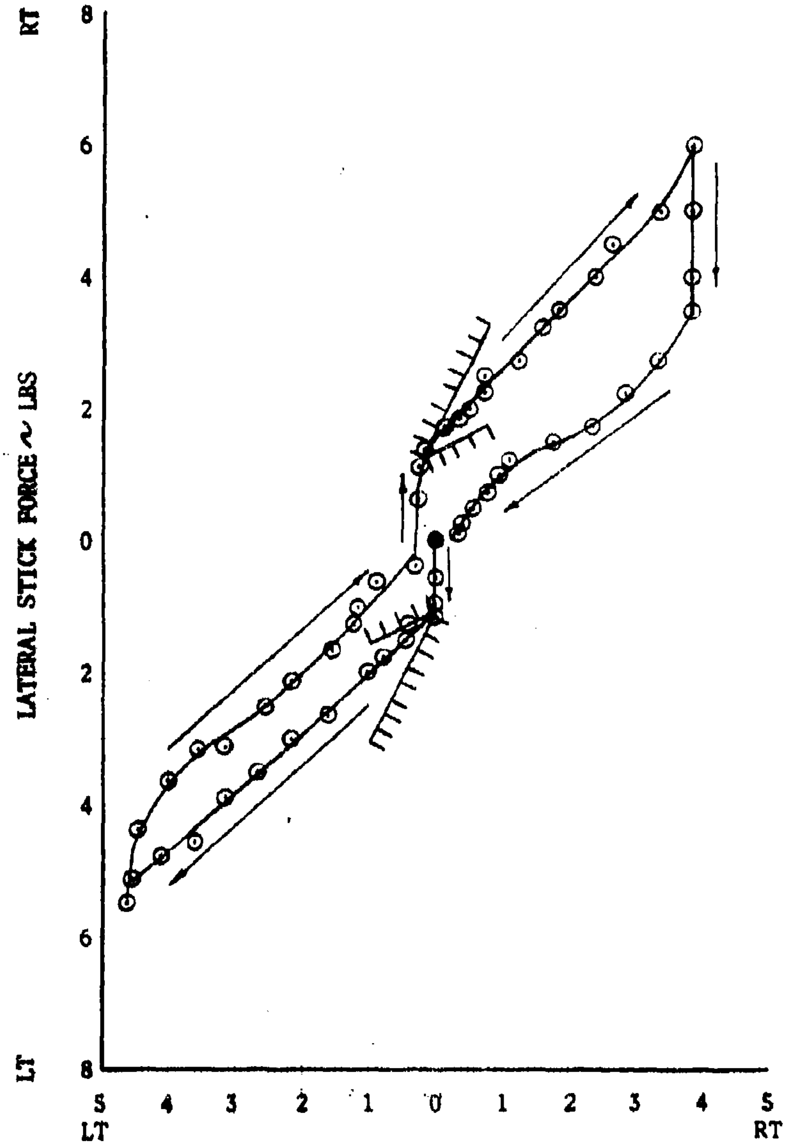


FIGURE NO. 100
DIRECTIONAL PEDAL POSITION VS. FORCE
CH-47B U.S.A. S/N 66-19100

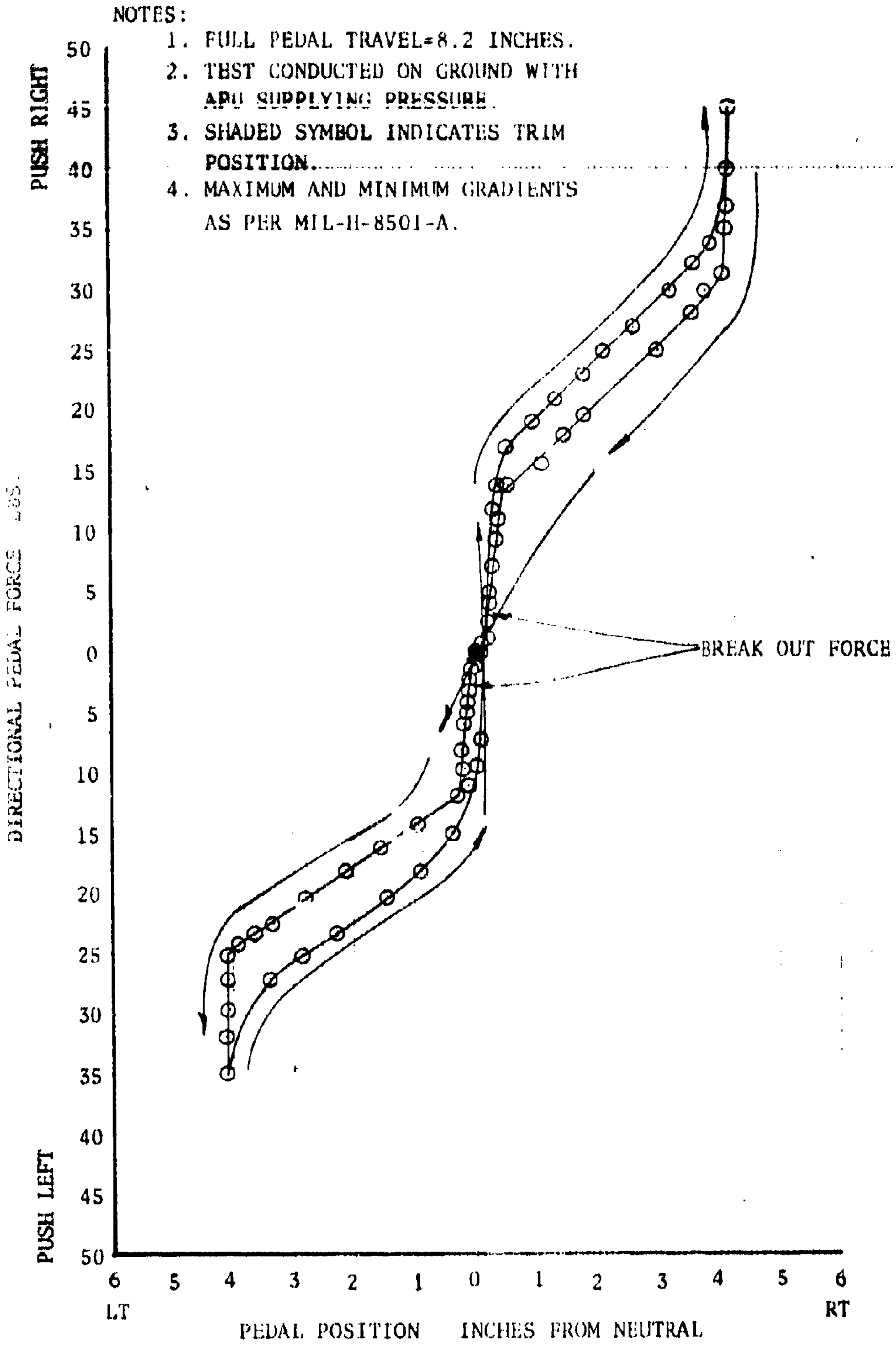


FIGURE NO. 101
COLLECTIVE STICK POSITION VS. FORCE
CH-47B U.S.A. S/N 66-19100

NOTES:
1. Full collective pitch level travel = 11.2 in.
2. Test conducted on ground with APU supplying pressure.
3. Test conducted with magnetic brake released.
4. Shaded symbol indicates trim position.

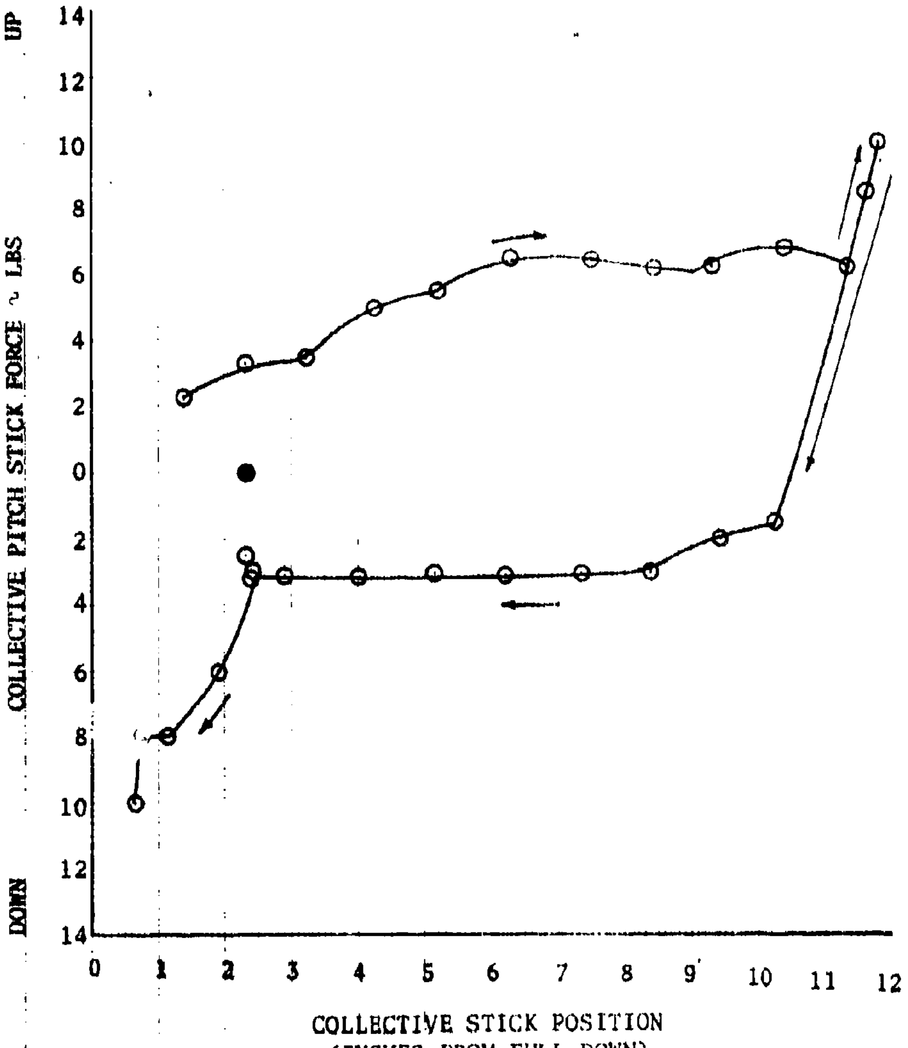


FIGURE NO. 102
LONGITUDINAL CONTROL RESPONSE
CH-47B U.S.A. S/N 66-19100
HOVER

AVERAGE GROSS WEIGHT = 27000 LB.
AVERAGE C.G. = 331.0 IN. (MID)
AVERAGE DENSITY ALTITUDE = 2890 FT.

TRIM AIRSPEED = 0.0 KCAS
AVERAGE ROTOR SPEED = 230 R.P.M.
S.A.S. - ON

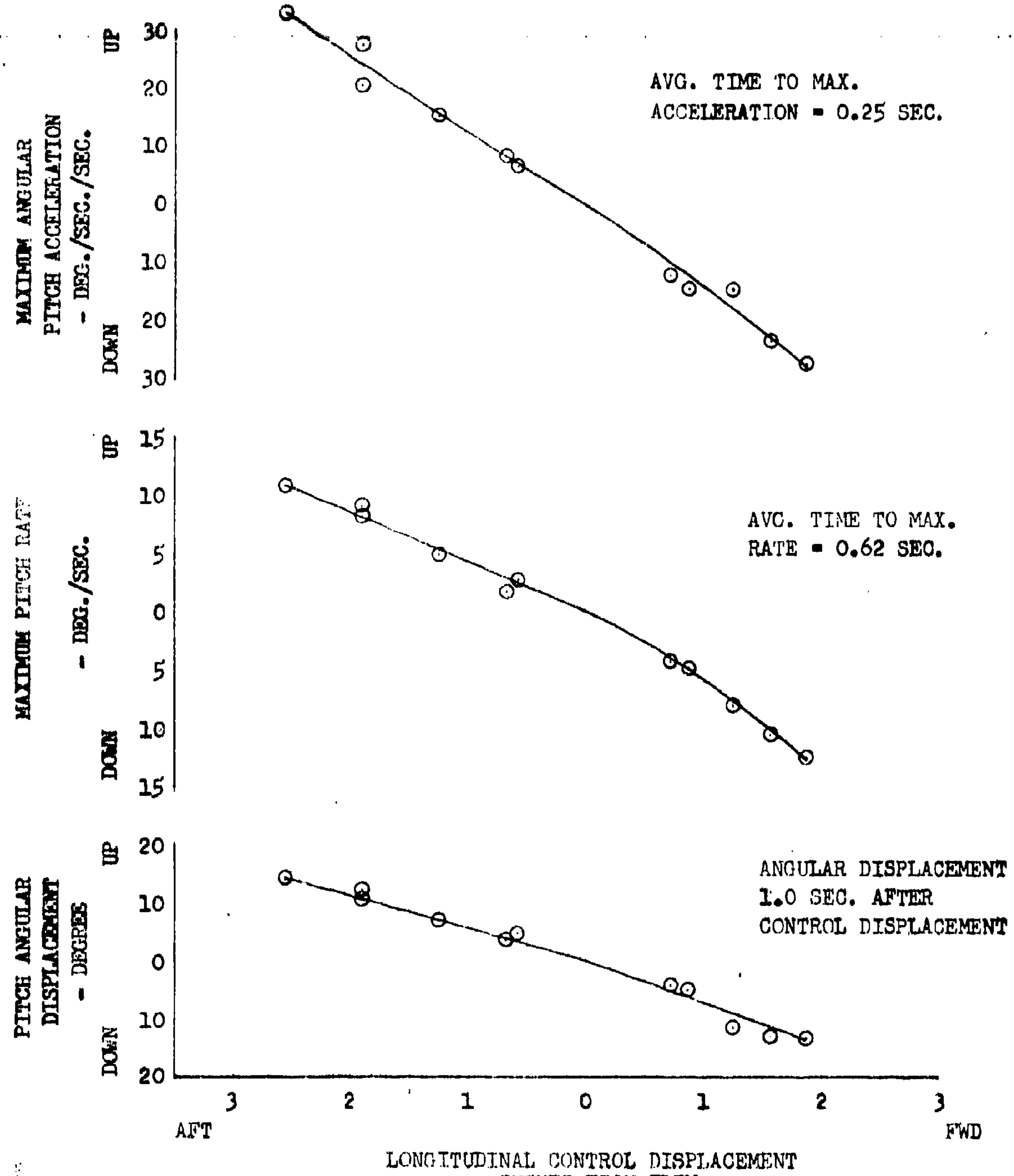


FIGURE NO. 103
LONGITUDINAL CONTROL RESPONSE
CH-47B U.S.A. S/N 66-19100
HOVER

AVERAGE GROSS WEIGHT = 31510 LB. TRIM AIRSPEED = 0.0 KCAS
AVERAGE C.G. = 310.1 (FWD) IN. AVERAGE ROTOR SPEED = 230 R.P.M.
AVERAGE DENSITY ALTITUDE = 10840 FT. S.A.S. - ON

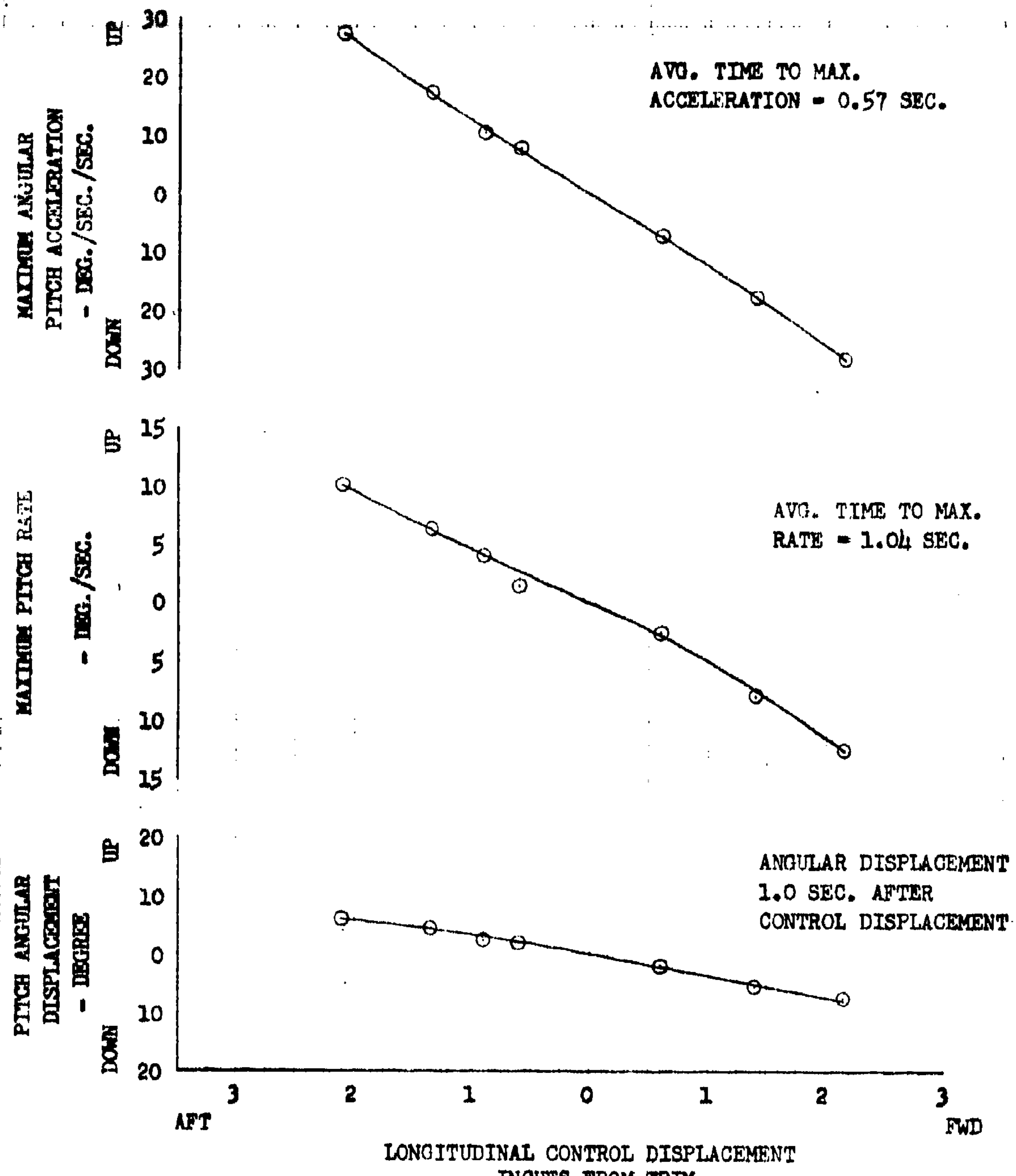


FIGURE NO. 104
LONGITUDINAL CONTROL RESPONSE
CH-47B U.S.A. S/N 66-19100
HOVER

AVERAGE GROSS WEIGHT = 37000 LB.
AVERAGE C.G. = 330.5 IN. (MID)
AVERAGE DENSITY ALTITUDE = 2400 FT.
TRIM AIRSPEED = 0.0 KCAS
AVERAGE ROTOR SPEED = 230 R.P.M.
S.A.S. - ON

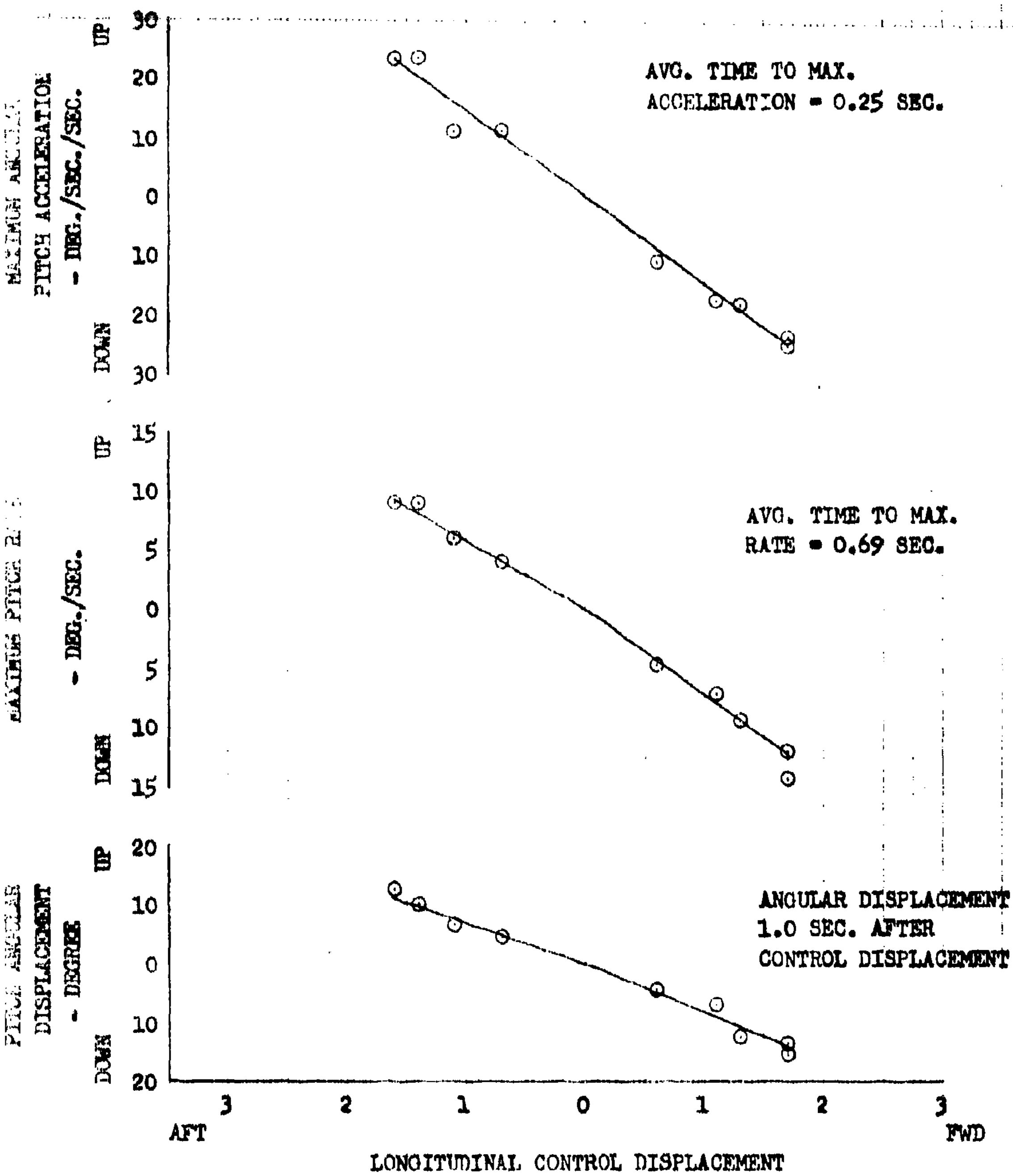


FIGURE NO. 105
LONGITUDINAL CONTROL RESPONSE
CH-47B U.S.A. S/N 66-19100
HOVER

AVERAGE GROSS WEIGHT = 37250 LB. TRIM AIRSPEED = 0.0 KCAS
AVERAGE C.G. = 314.2 (FWD) IN. AVERAGE ROTOR SPEED = 230 R.P.M.
AVERAGE DENSITY ALTITUDE = 2900 FT. S.A.S. - ON

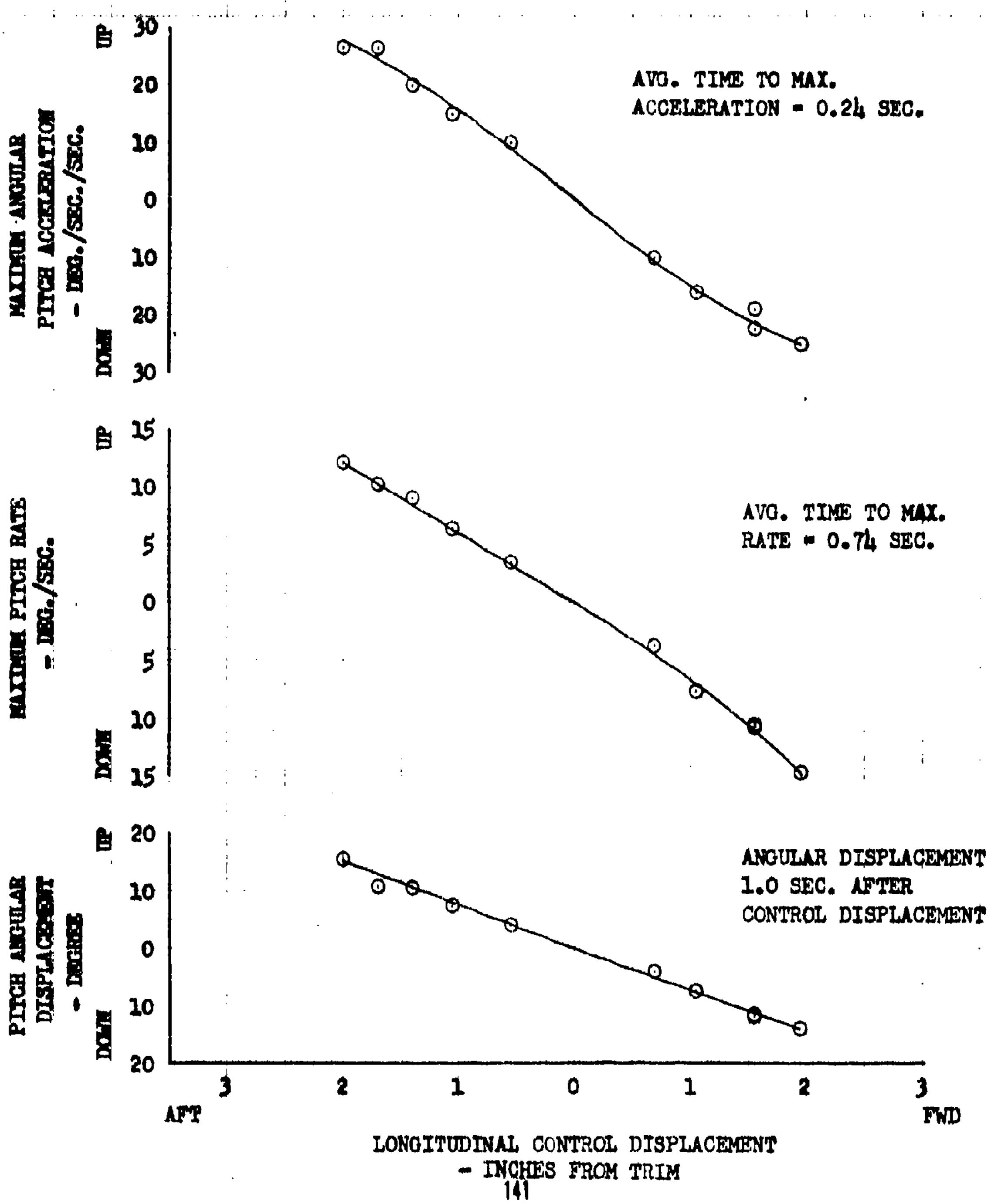


FIGURE NO. 106
LONGITUDINAL CONTROL RESPONSE
CH-47B U.S.A. S/N 66-19100
HOVER

AVERAGE GROSS WEIGHT = 37520 LB. TRIM AIRSPEED = 0.0 KCAS
AVERAGE C.G. = 336.1 (AFT) IN. AVERAGE ROTOR SPEED = 230 R.P.M.
AVERAGE DENSITY ALTITUDE = 2850 FT. S.A.S. - ON

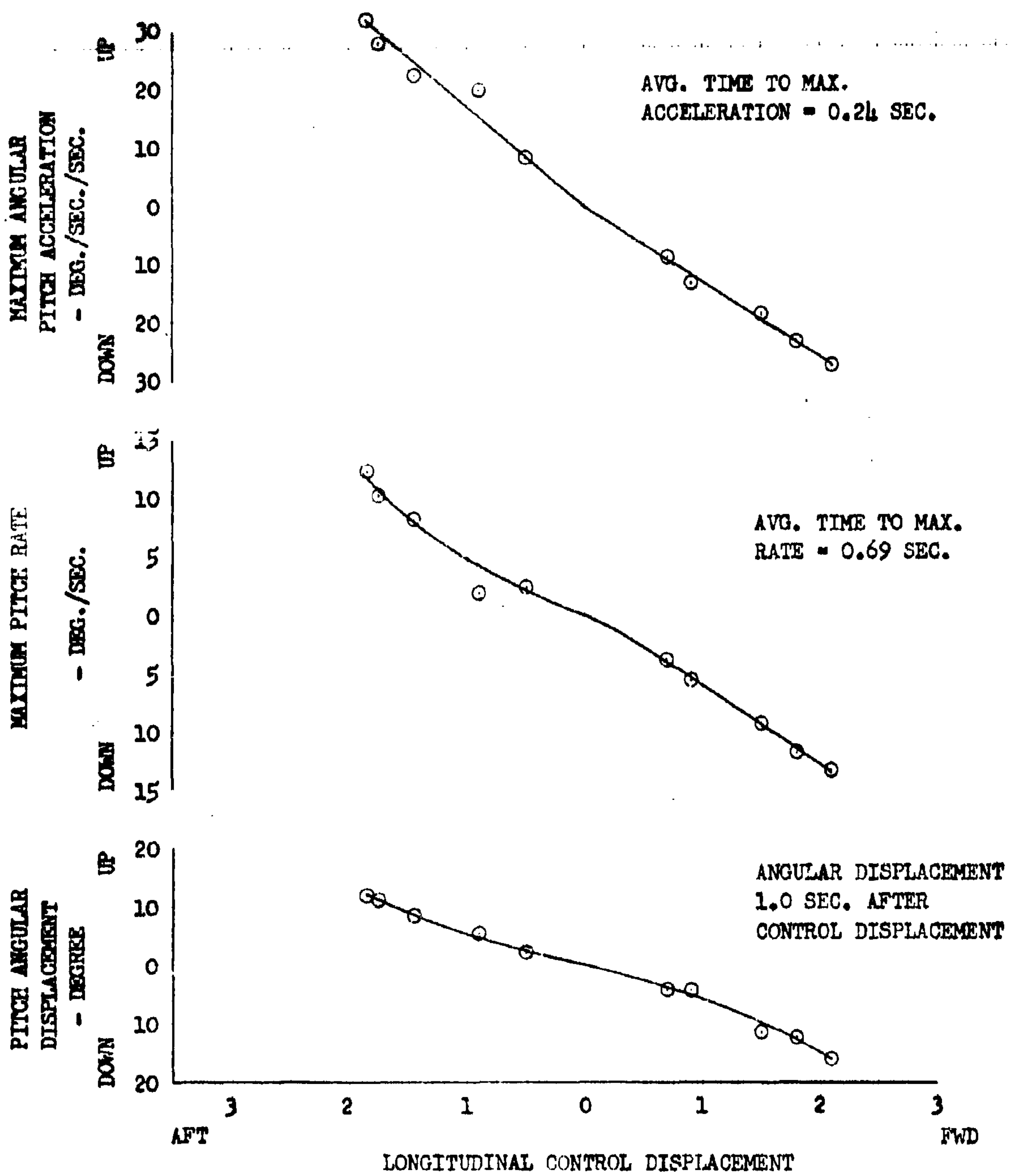


FIGURE NO. 107

LATERAL CONTROL RESPONSE

CH-47B U.S.A. S/N 66-19100

HOVER

AVERAGE GROSS WEIGHT = 27000 LB. TRIM AIRSPEED = 0.0 KCAS

AVERAGE C.G. = 331.0 IN. (MID) AVERAGE ROTOR SPEED = 230 R.P.M.

AVERAGE DENSITY ALTITUDE = 2890 FT. S.A.S. - ON

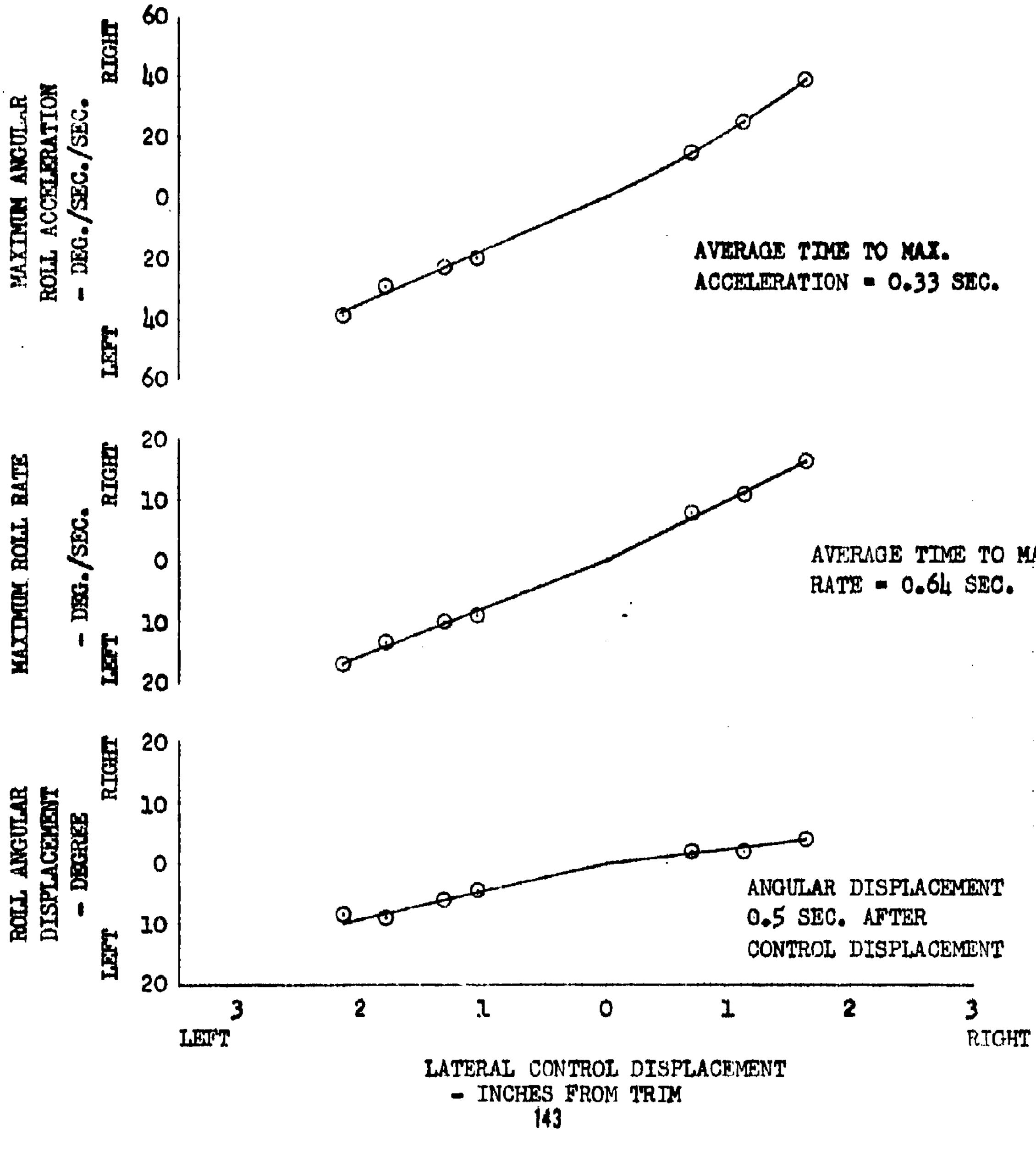


FIGURE NO. 108
LATERAL CONTROL RESPONSE
CH-47B U.S.A. S/N 66-19100
HOVER

AVERAGE GROSS WEIGHT = 37000 LB. TRIM AIRSPEED = 0.0 KCAS
AVERAGE C.G. = 330.5 IN. (MID) AVERAGE ROTOR SPEED = 230 R.P.M.
AVERAGE DENSITY ALTITUDE = 2400 FT. S.A.S. - ON

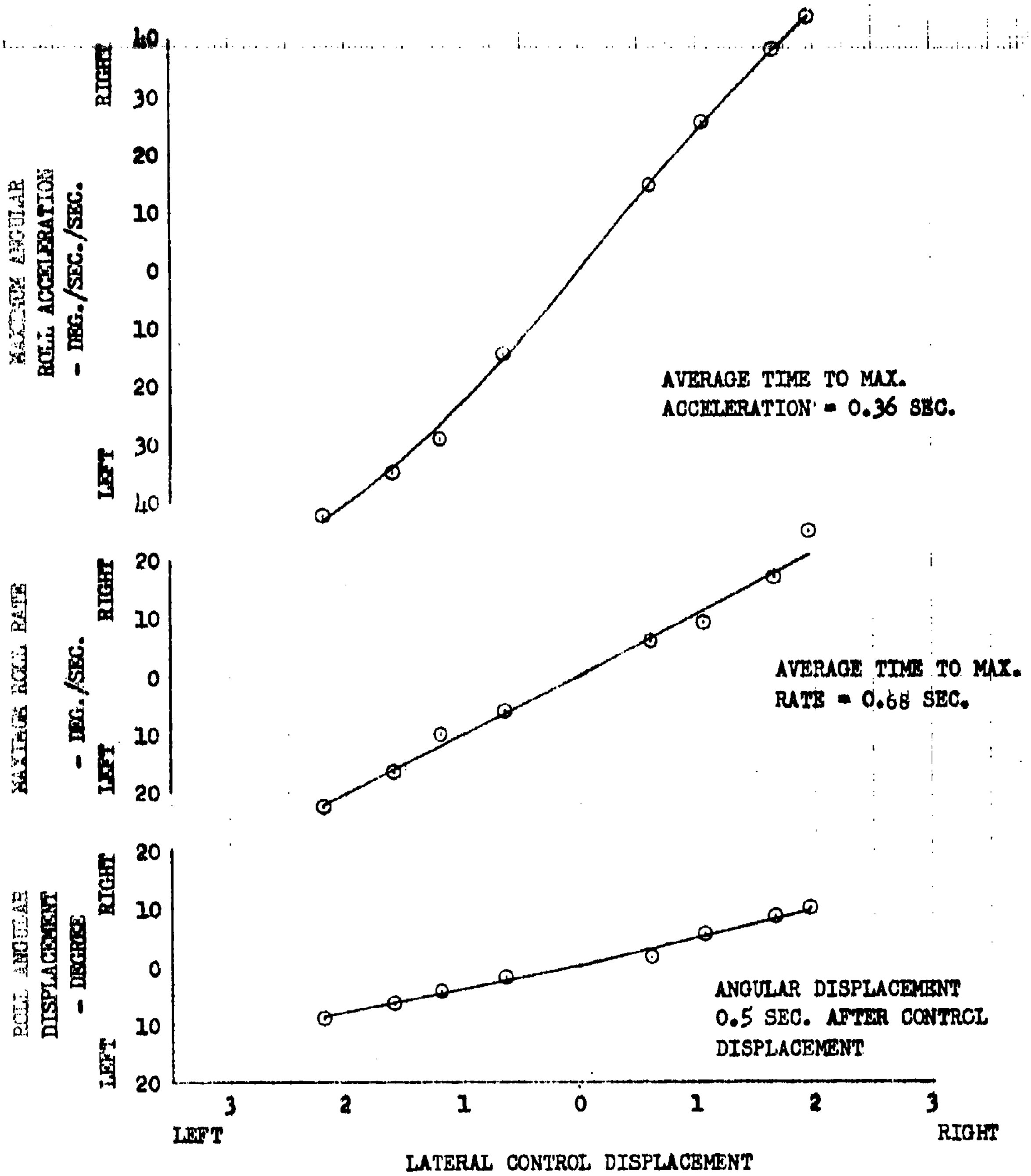


FIGURE NO. 109
DIRECTIONAL CONTROL RESPONSE
CH-47B U.S.A. S/N 66-19100
HOVER

AVERAGE GROSS WEIGHT = 27000 LB.
AVERAGE C.G. = 331.0 IN. (MID)
AVERAGE DENSITY ALTITUDE = 2890 FT.

TRIM AIRSPEED = 0.0 KCAS
AVERAGE ROTOR SPEED = 230 R.P.M.
S.A.S. - ON

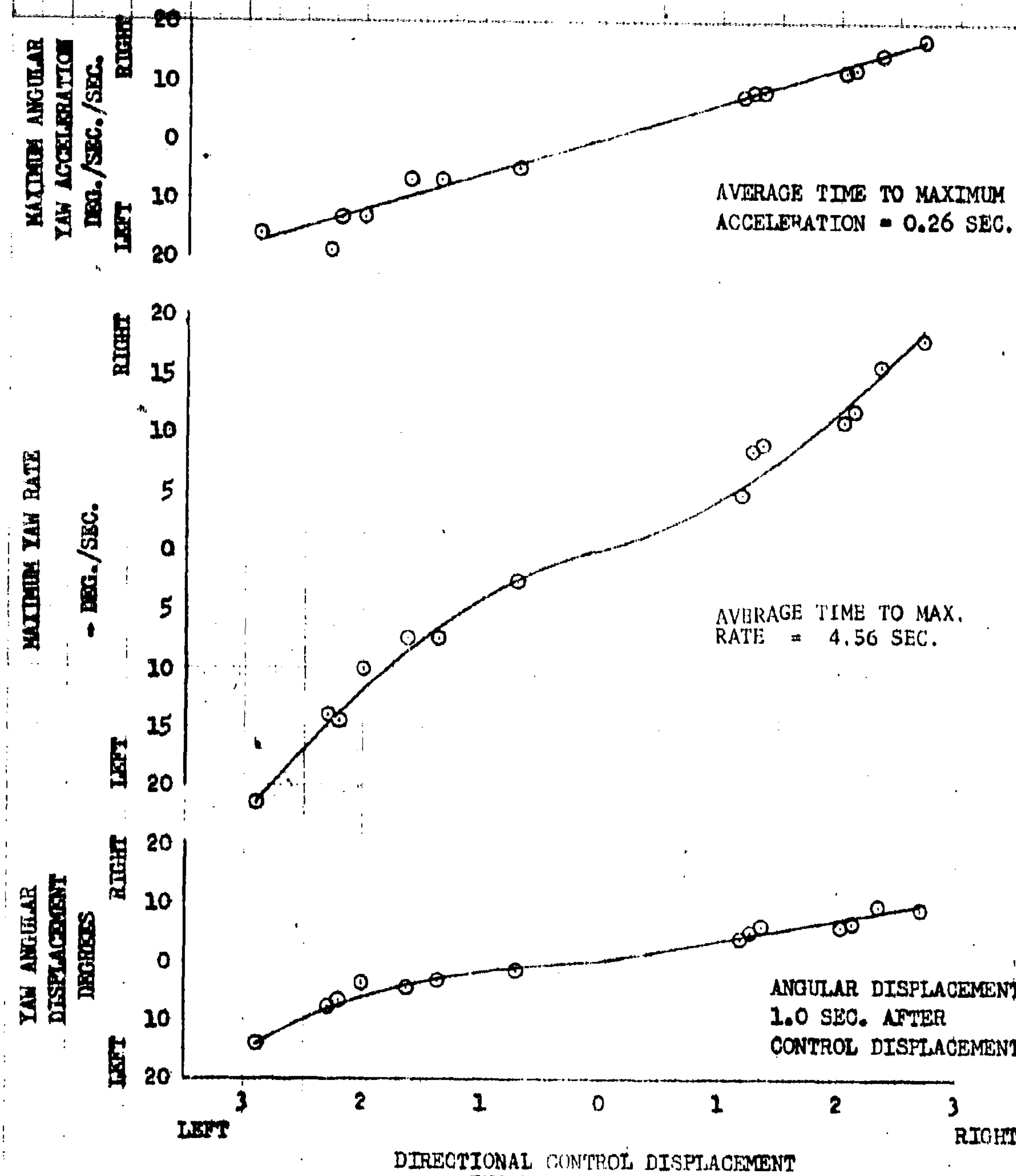


FIGURE NO. 110
DIRECTIONAL CONTROL RESPONSE
CH-47B U.S.A. S/N 66-19100
HOVER

AVERAGE GROSS WEIGHT = 37000 LB.
AVERAGE C.G. = 330.5 IN. (MID)
AVERAGE DENSITY ALTITUDE = 2400 FT.

TRIM AIRSPEED = 0.0 KCAS
AVERAGE ROTOR SPEED = 230 R.P.M.
S.A.S. - ON

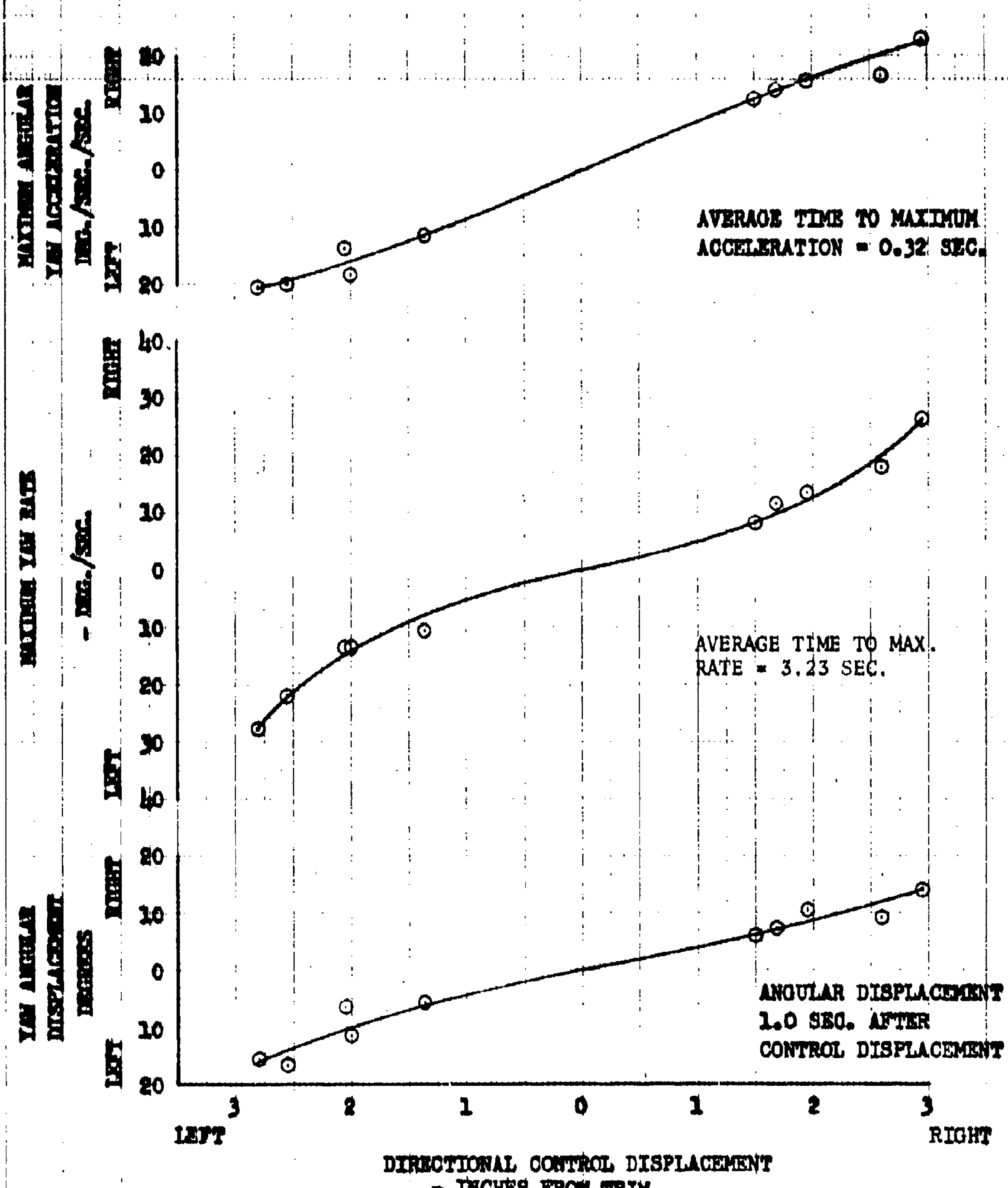


FIGURE NO. 111
LONGITUDINAL CONTROL RESPONSE
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. ROTOR SPEED R.P.M.	AVG. C.G. IN.	AVG. TRIM CALIBRATED AIRSPEED KTS.
○	35880	10280	230	313.5 (FWD)	68.5
□	35880	10280	230	313.5 (FWD)	79.5
△	35880	10280	230	336.0 (AFT)	91.0
◇	26350	10280	230	331.3 (MID)	95.5
▷	26350	10280	230	331.3 (MID)	110.5

NOTES: 1. SHADED SYMBOLS DENOTE 35880 LB. 336.0 (AFT) C.G.
2. FLAGGED SYMBOLS DENOTE 26350 LB. 331.3 (MID) C.G.

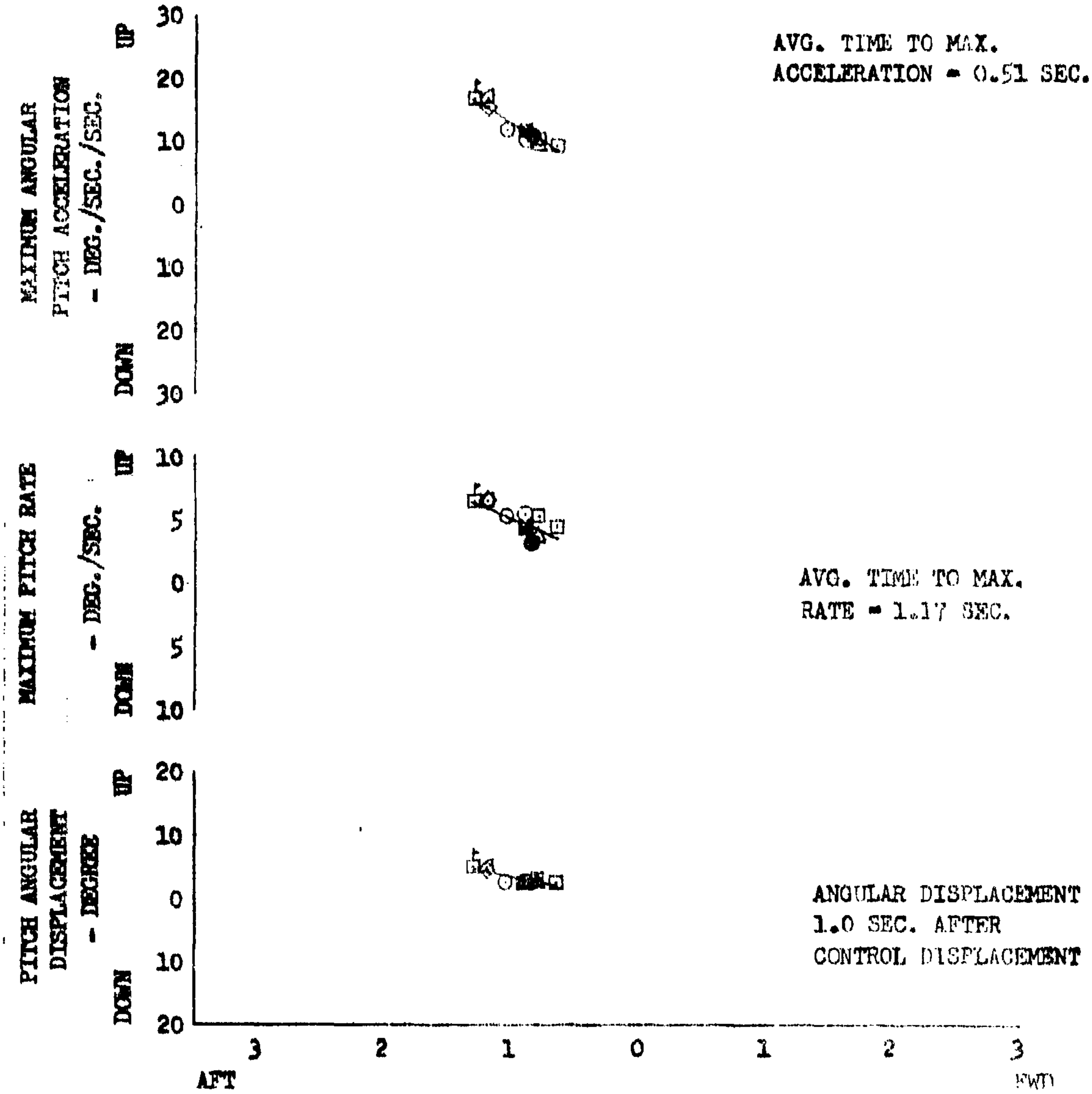


FIGURE NO. 112
LONGITUDINAL CONTROL RESPONSE
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. ROTOR SPEED R.P.M.	AVG. C.G. IN.	AVG. TRIM CALIBRATED AIRSPEED KTS.
○	37220	4860	230	336.0 (AFT)	70.5
□	37220	4860	230	336.0 (AFT)	80.0
△	37220	4860	230	336.0 (AFT)	87.0
◇	37220	4860	230	336.0 (AFT)	100.5
◺	37220	4860	230	336.0 (AFT)	112.0
◬	37220	4860	230	336.0 (AFT)	123.0

NOTE: SHADED SYMBOL DENOTES 313.6 IN. FWD. C.G.

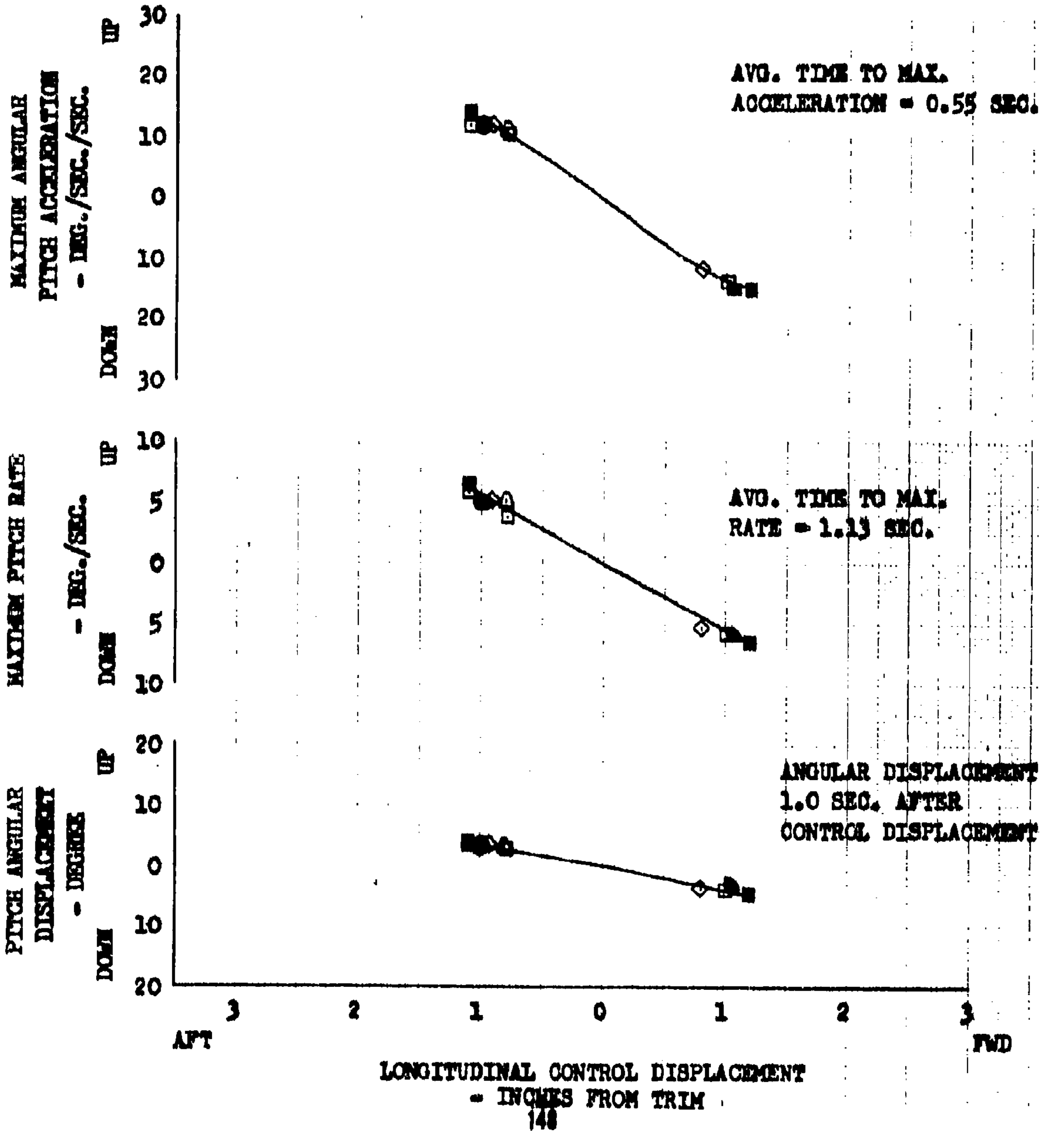


FIGURE NO. 113
LONGITUDINAL CONTROL RESPONSE
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. ROTOR SPEED R.P.M.	AVG. C.G. IN.	AVG. TRIM CALIBRATED AIRSPEED KTS.
⊙	37560	5130	230	330.9 (MID)	79.5
⊡	37560	5130	230	330.9 (MID)	101.0
△	37560	5130	230	330.9 (MID)	111.0
◇	37560	5130	230	330.9 (MID)	130.0
▷	37560	5130	230	330.9 (MID)	138.0

NOTE: SHADED SYMBOL DENOTES 27270 LB. GROSS WEIGHT.

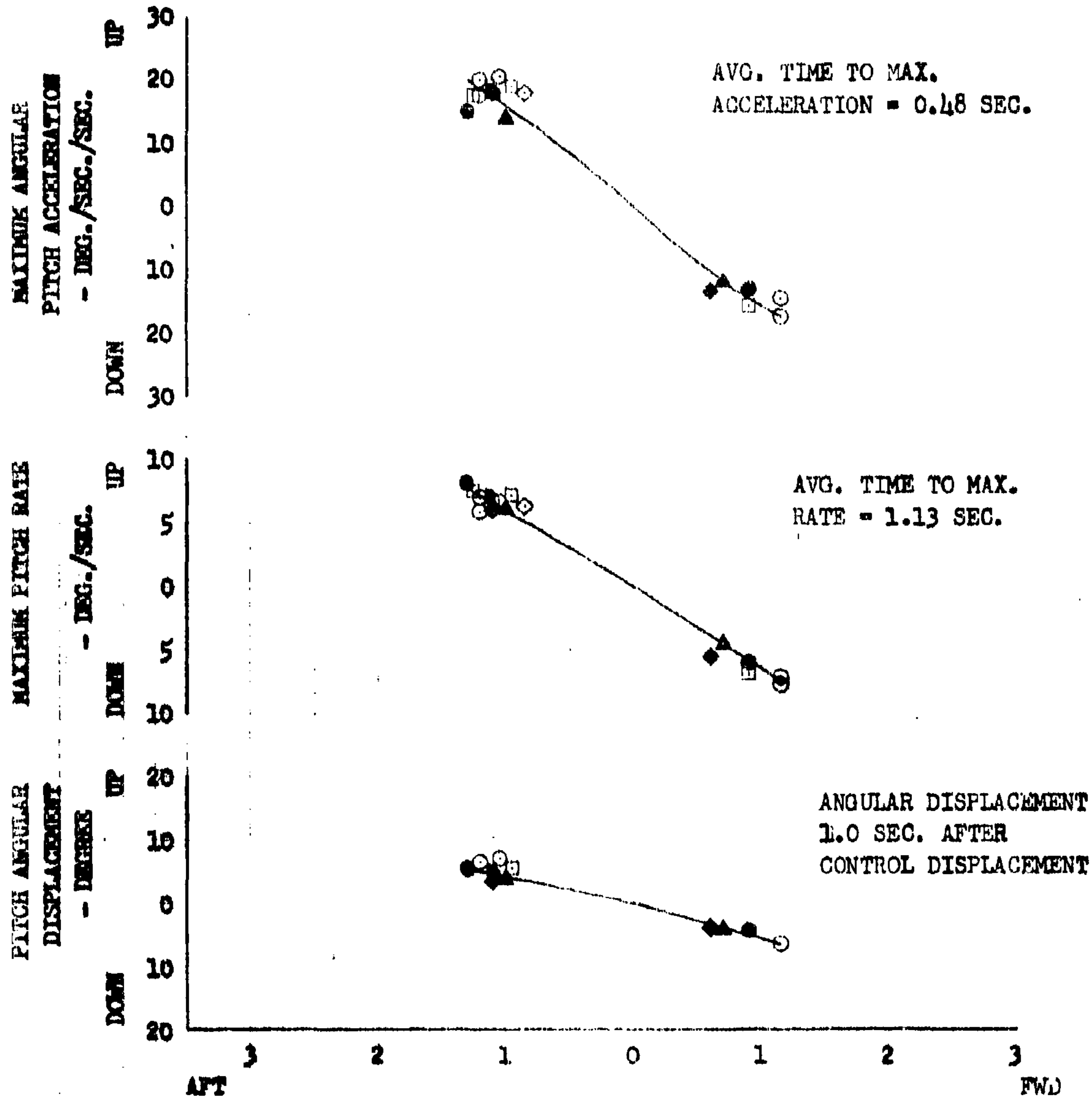


FIGURE NO. 114
LATERAL CONTROL RESPONSE
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. ROTOR SPEED R.P.M.	AVG. C.G. IN.	AVG. TRIM CALIBRATED AIRSPEED KTS.
⊙	37370	4850	230	336.1 (AFT)	80.0
⊡	37370	4850	230	313.7 (FWD)	80.0
△	37370	4850	230	336.1 (AFT)	101.0
◇	37370	4850	230	313.7 (FWD)	101.0
◺	37370	4850	230	336.1 (AFT)	122.0

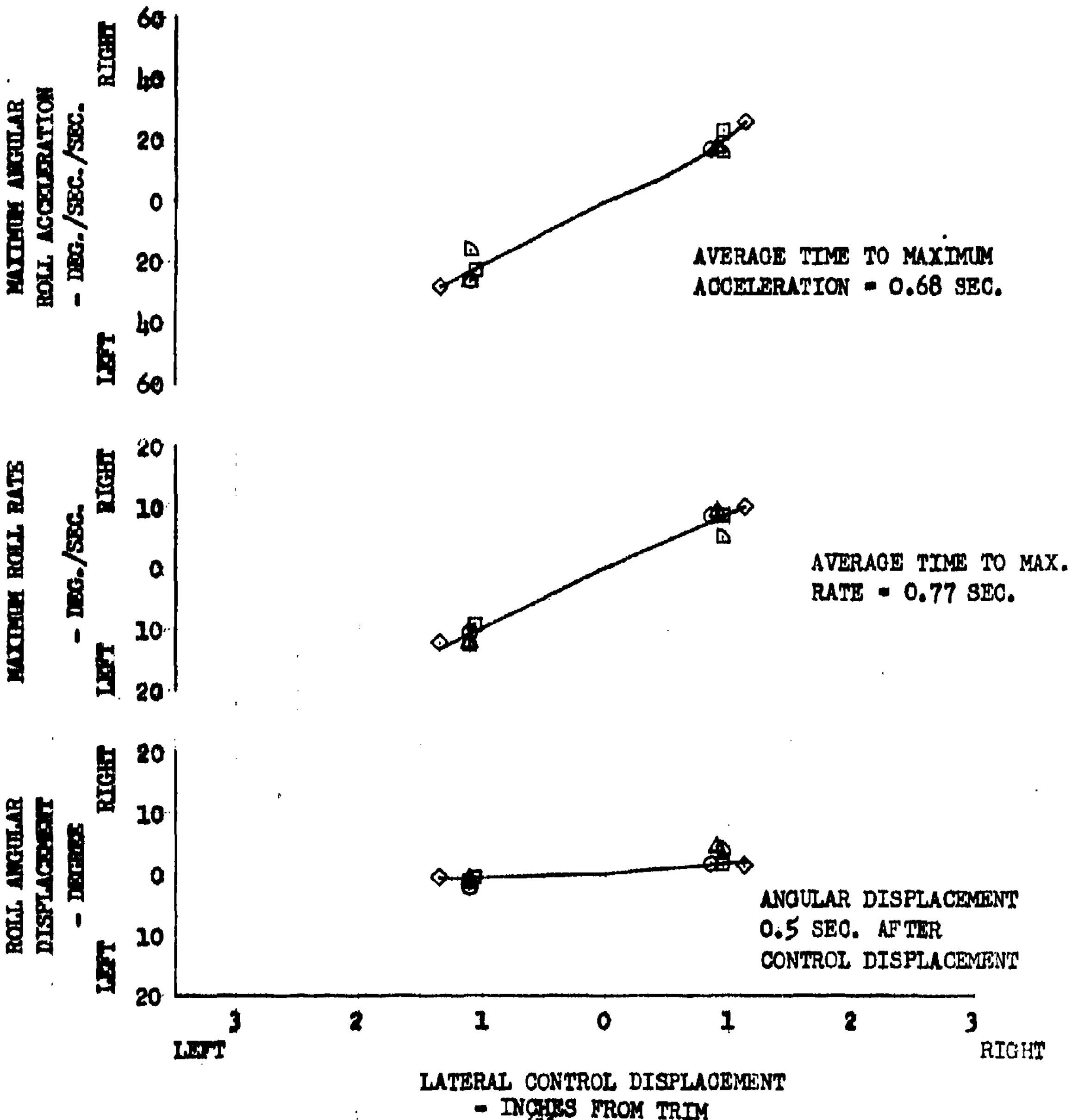


FIGURE NO. 115
LATERAL CONTROL RESPONSE
CH -47B U.S.A. S/N 66-19100
LEVEL FLIGHT

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. ROTOR SPEED R.P.M.	AVG. C.G. IN.	AVG. TRIM CALIBRATED AIRSPEED KTS.
⊙	37590	5220	230	331.0 (MID)	79.0
⊡	27350	5220	230	330.8 (MID)	79.0
△	37590	5220	230	331.0 (MID)	101.0
◇	27350	5220	230	330.8 (MID)	113.0
◺	27350	5220	230	330.8 (MID)	131.0

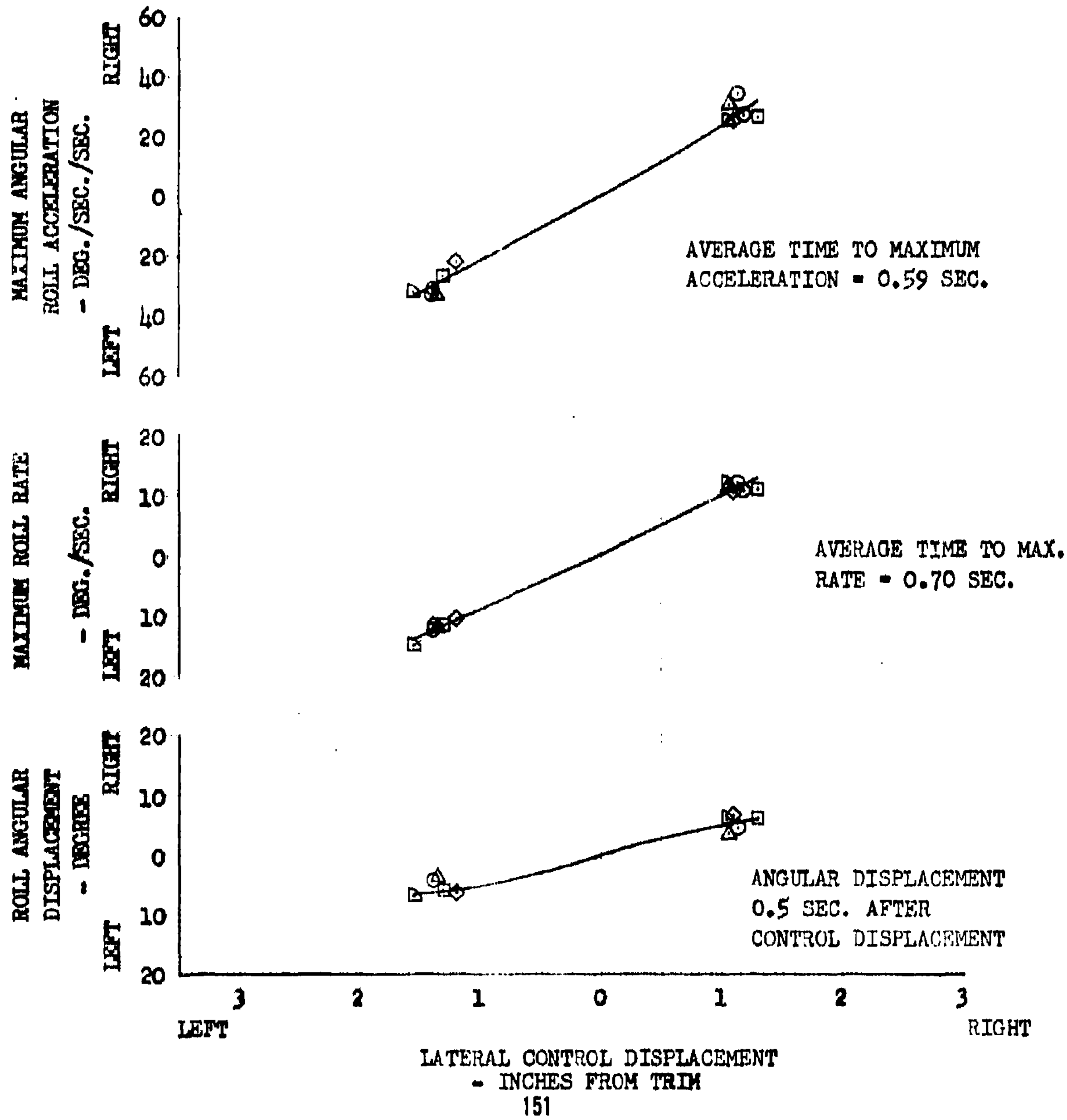


FIGURE NO. 116
DIRECTIONAL CONTROL RESPONSE
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. ROTOR SPEED R.P.M.	AVG. C.G. IN.	AVG. TRIM CALIBRATED AIRSPEED KTS.
⊙	37440	4930	230	313.7 (FWD)	80.0
⊡	37440	4930	230	313.7 (FWD)	101.0

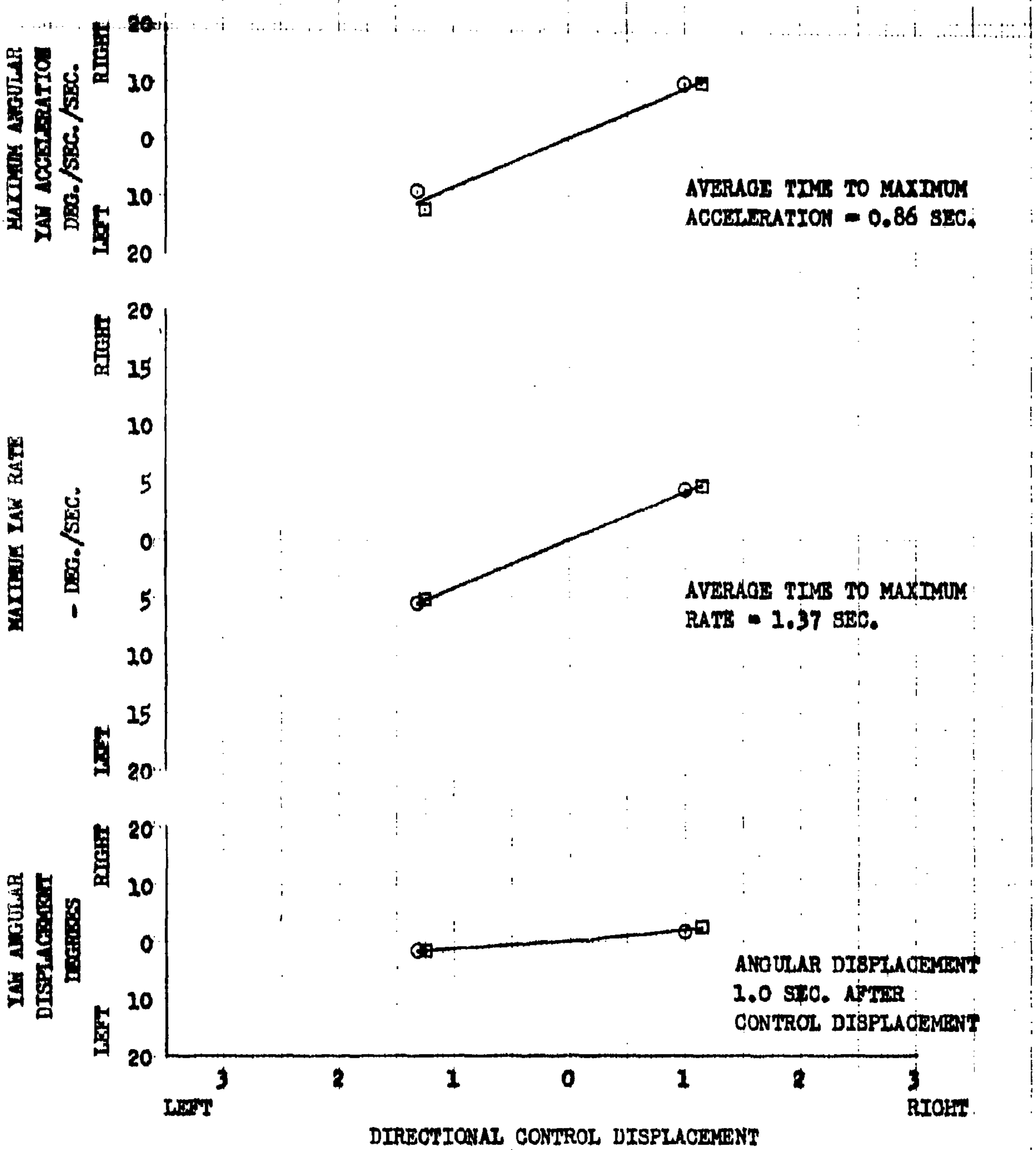


FIGURE NO. 117
CONTROL POSITION IN SIDEWARD FLIGHT
CH-47B USA S/N 66-19100

SYM	AVG GROSS WEIGHT LB	AVG DENSITY ALTITUDE FT	AVG C.G. IN.	AVG ROTOR SPEED RPM
O	25600	2200	331.7 (MID)	230
□	36020	2200	330.5 (MID)	230

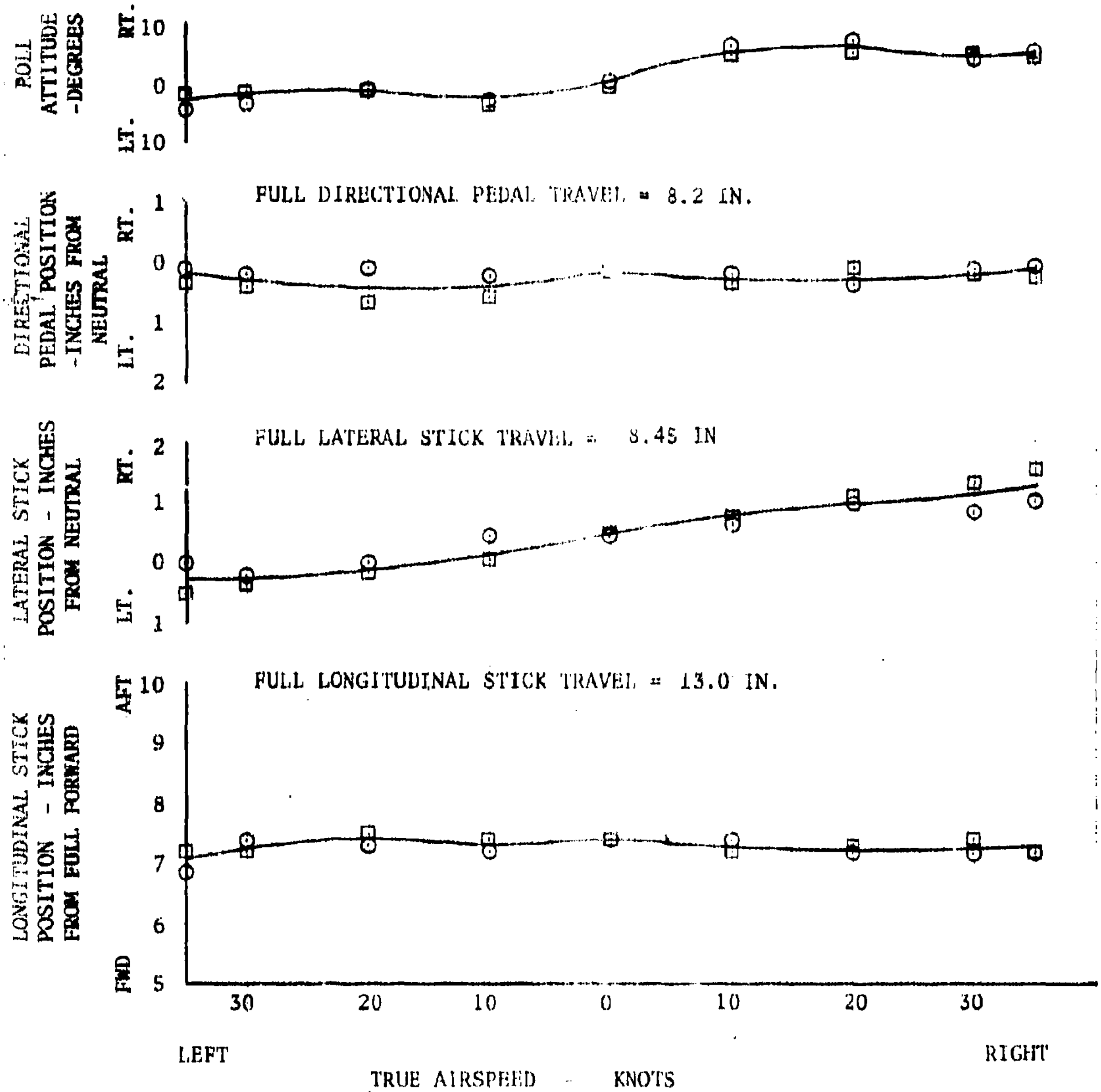


FIGURE NO. 118
CONTROL POSITION IN SIDEWARD FLIGHT
CH-47B USA S/N 66-19100

SYM	AVG GROSS WEIGHT LB	AVG DENSITY ALTITUDE FT	AVG C.G. IN.	AVG ROTOR SPEED RPM
○	25600	2200	331.7 (MID)	230
□	36020	2200	330.5 (MID)	230

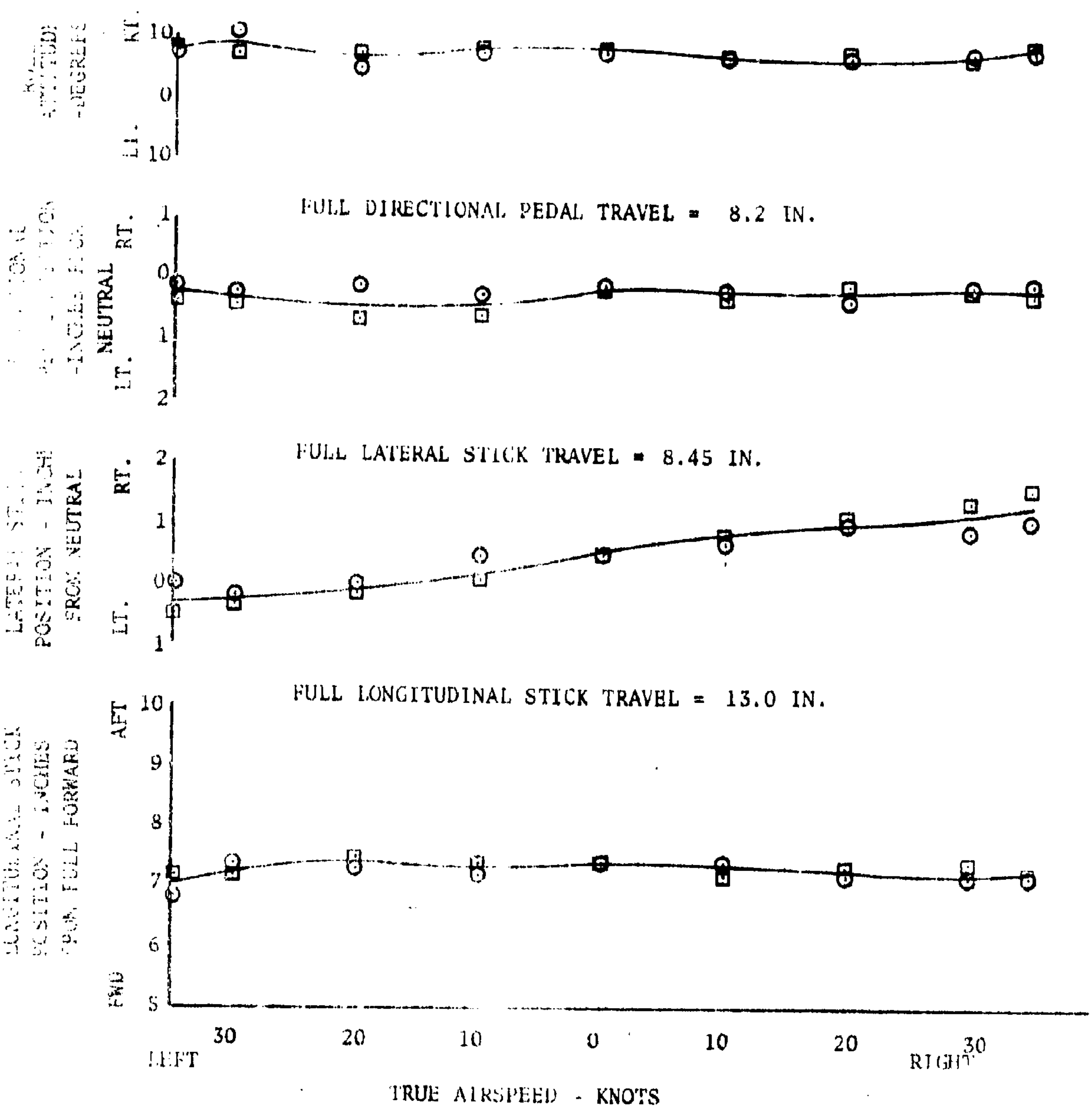


FIGURE NO. 119
CONTROL POSITION IN SIDEWARD FLIGHT
CH-47B USA S/N 66-19100

SYM	AVG GROSS WEIGHT LB	AVG DENSITY ALTITUDE FT	AVG C.G. IN.	AVG ROTOR SPEED RPM
○	36020	2200	331.4 (MID)	230
□	36330	2200	336.7 (AFT)	230
△	35640	2200	314.0 (FWD)	230

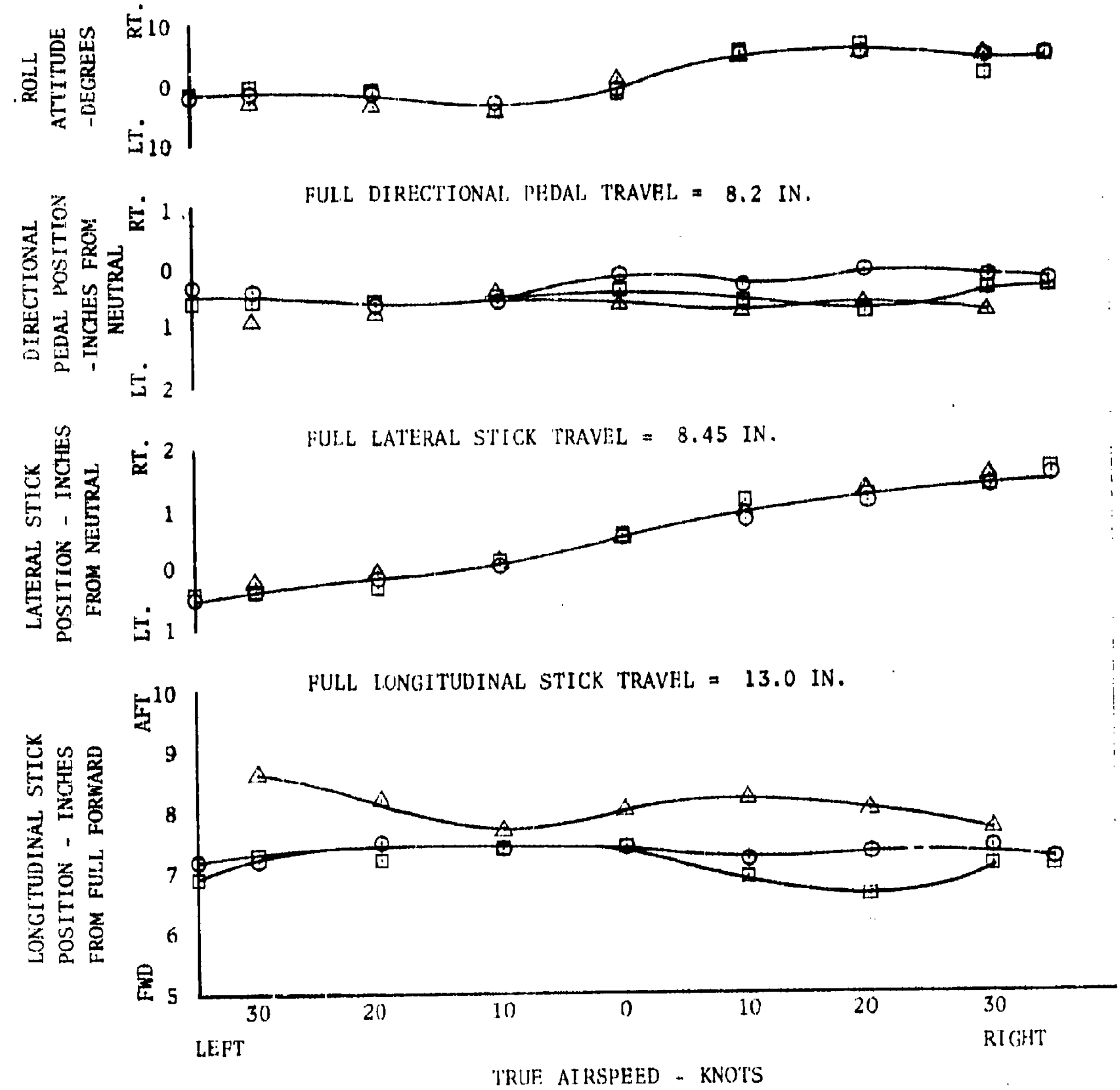


FIGURE NO. 120
CONTROL POSITION IN SIDEWARD FLIGHT
CH-47B USA S/N 66-19100

SYM	AVG GROSS WEIGHT LB	AVG DENSITY ALTITUDE FT	AVG C.G. IN.	AVG ROTOR SPEED RPM
○	35640	2200	314.0(FWD)	230
□	30520	9500	309.9(FWD)	230

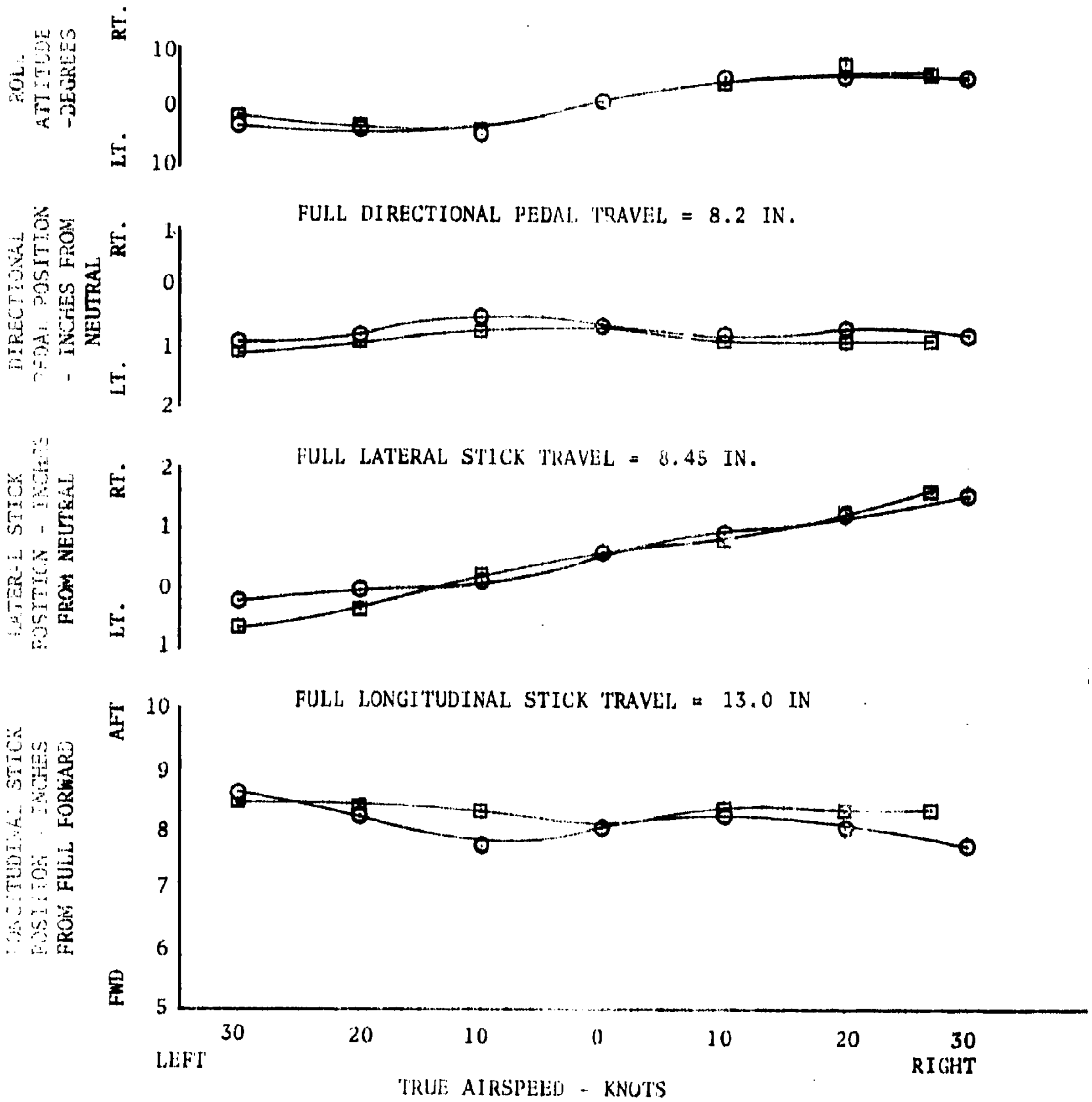


FIGURE NO. 121
CONTROL POSITION IN REARWARD FLIGHT
CH-47B USA S/N 66-19100

SYM	AVG GROSS WEIGHT LB.	AVG DENSITY ALTITUDE FT.	AVG C.G. IN.	AVG ROTOR SPEED RPM
⊙	35640	2200	314.0 (FWD)	230
⊡	30520	9500	309.9 (FWD)	230

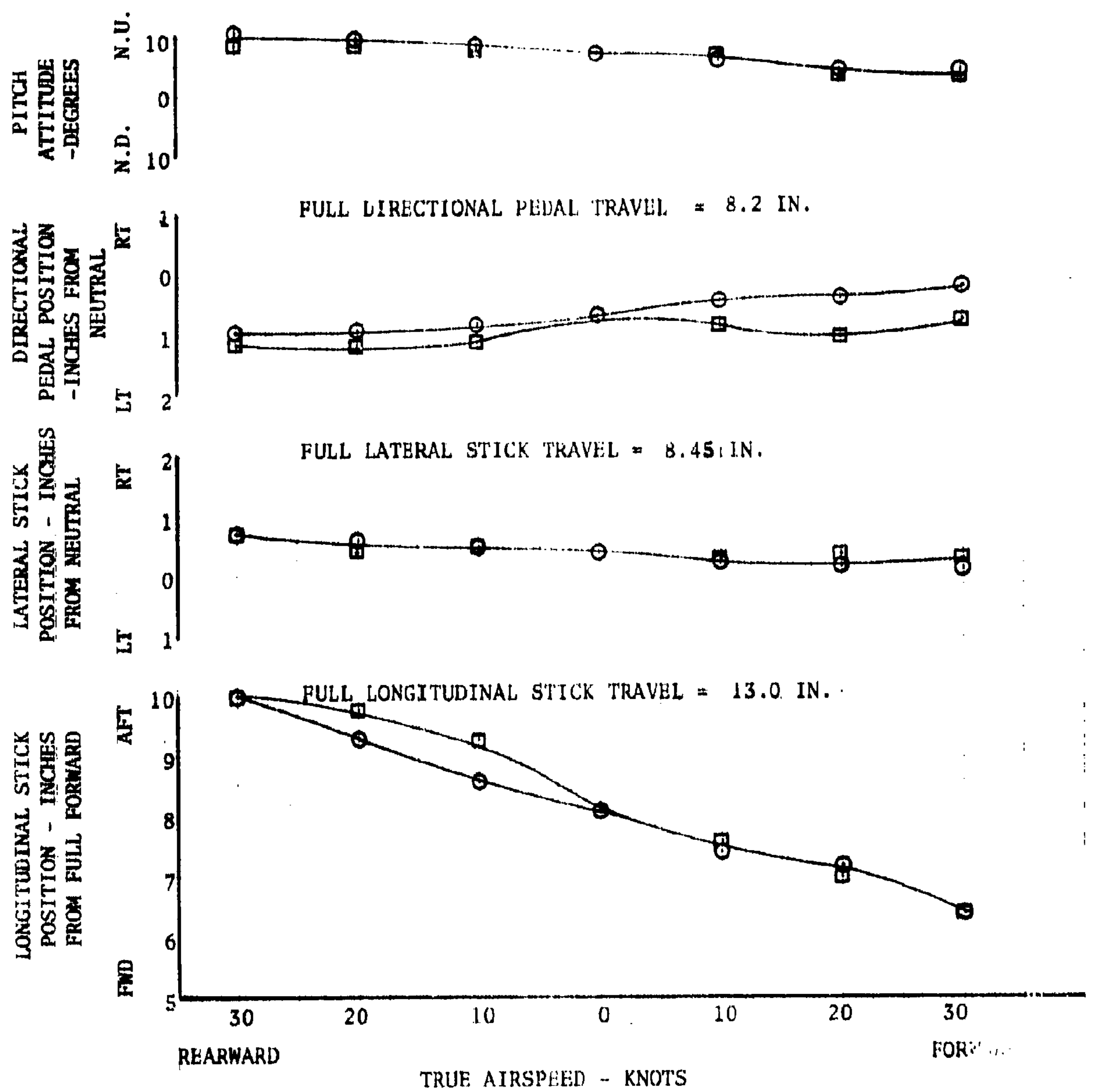


FIGURE NO. 122
CONTROL POSITION IN REARWARD FLIGHT
CH-47B USA S/N 66-19100

SYM	AVG GROSS WEIGHT LB.	AVG DENSITY ALTITUDE FT.	AVG C.G. IN.	AVG ROTOR SPEED RPM
○	26600	2200	331.7 (MID)	230
◻	36020	2200	330.5 (MID)	230

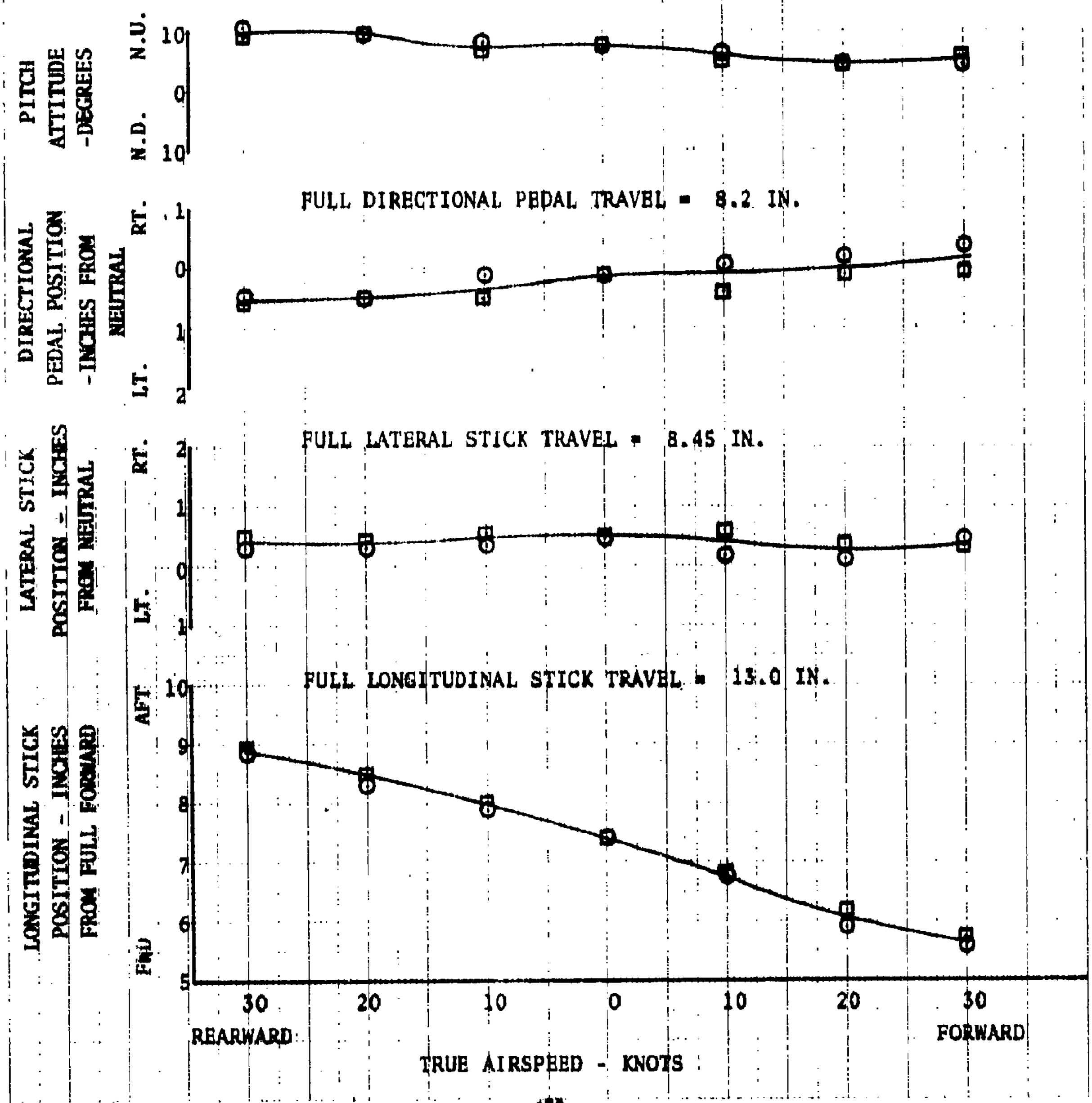


FIGURE NO. 123
CONTROL POSITION IN REARWARD FLIGHT
CH-47B USA S/N 66-19100

SYM	AVG GROSS WEIGHT LB	AVG DENSITY ALTITUDE FT	AVG C.G. IN.	AVG ROTOR SPEED R.P.M.
○	36020	2200	331.4 (MID)	230
□	36330	2200	336.7 (AFT)	230
△	35640	2200	314.0 (FWD)	230

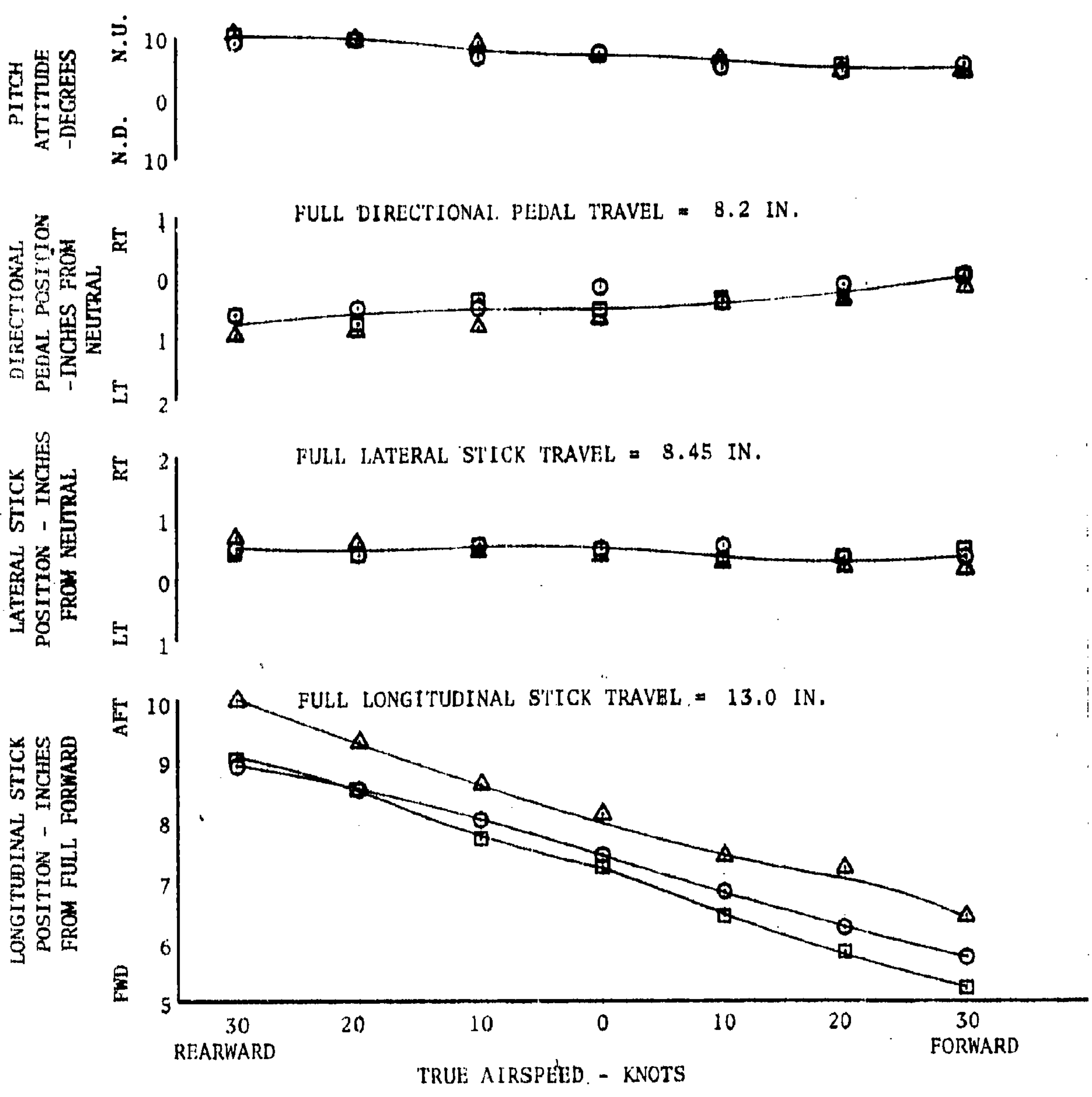


FIGURE NO. 124
TRIM CURVES IN LEVEL FLIGHT
CH-47B USA S/N 66-19100

SYM	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
O	26660	6460	330.6(MID)	230
□	28750	4650	311.2(FWD)	230

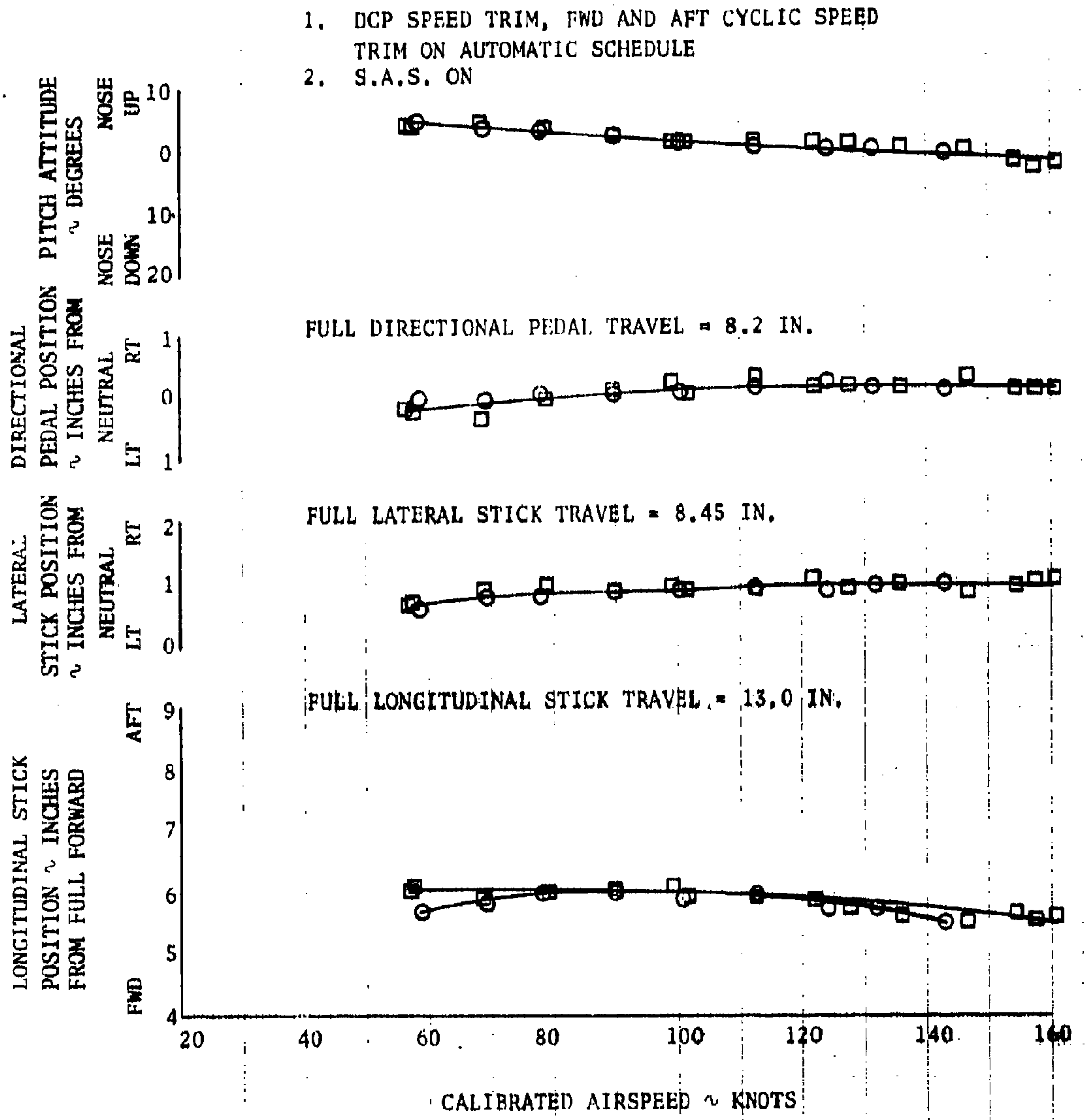


FIGURE NO. 125
TRIM CURVES IN LEVEL FLIGHT
CH-47B USA S/N 66-19100

SYM	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
O	28060	4750	347.0(AFT)	225
□	28830	3910	330.0(MID)	225

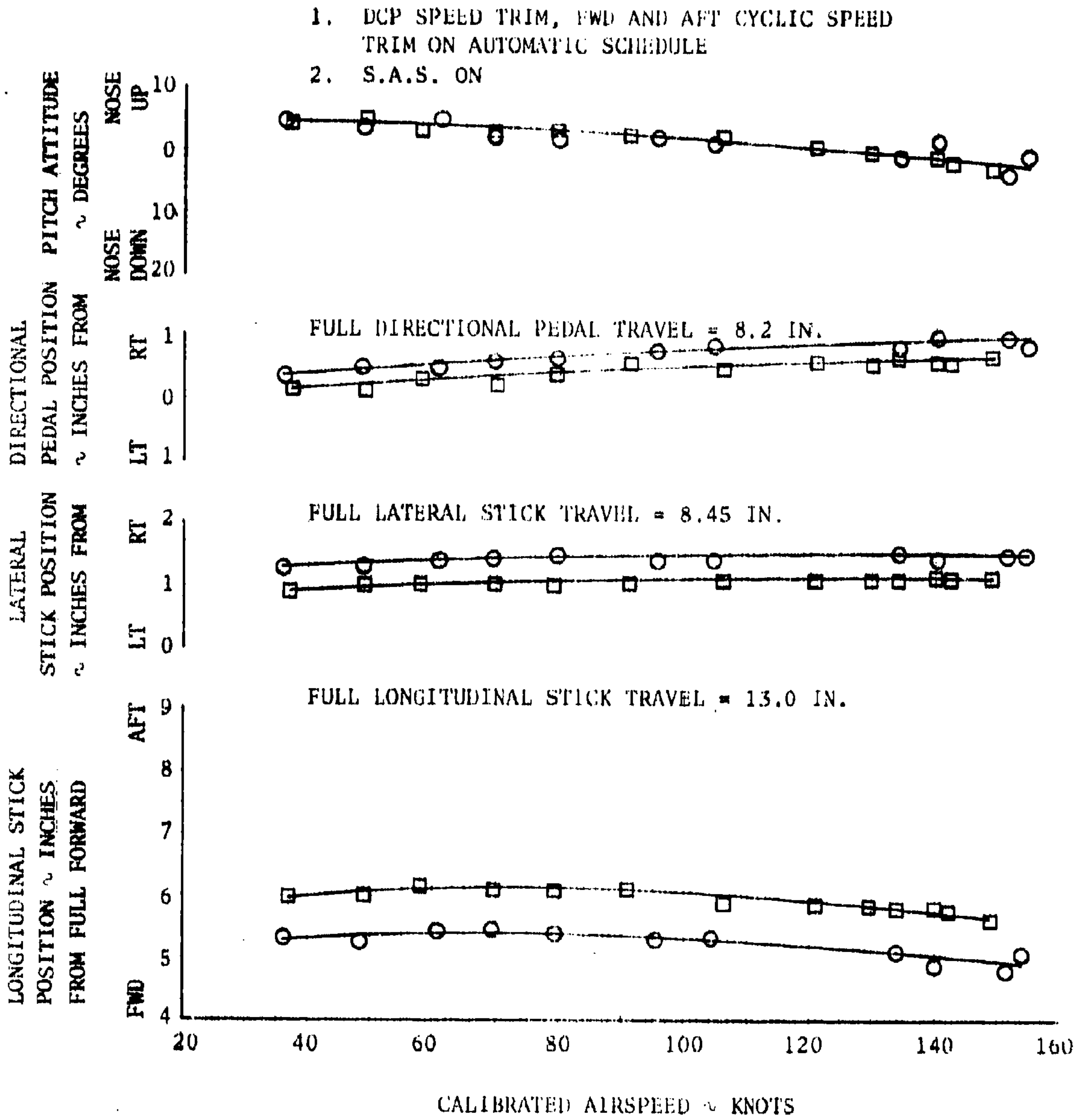


FIGURE NO. 126

TRIM CURVES IN LEVEL FLIGHT

CH-47B U.S.A. S/N 66-19100

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
⊙	~26660	6460	330.6(MID)	230
⊡	~25830	11520	330.9(MID)	230
◊	~25910	1380	331.5(MID)	230

NOTES:

1. D.C.P. SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON

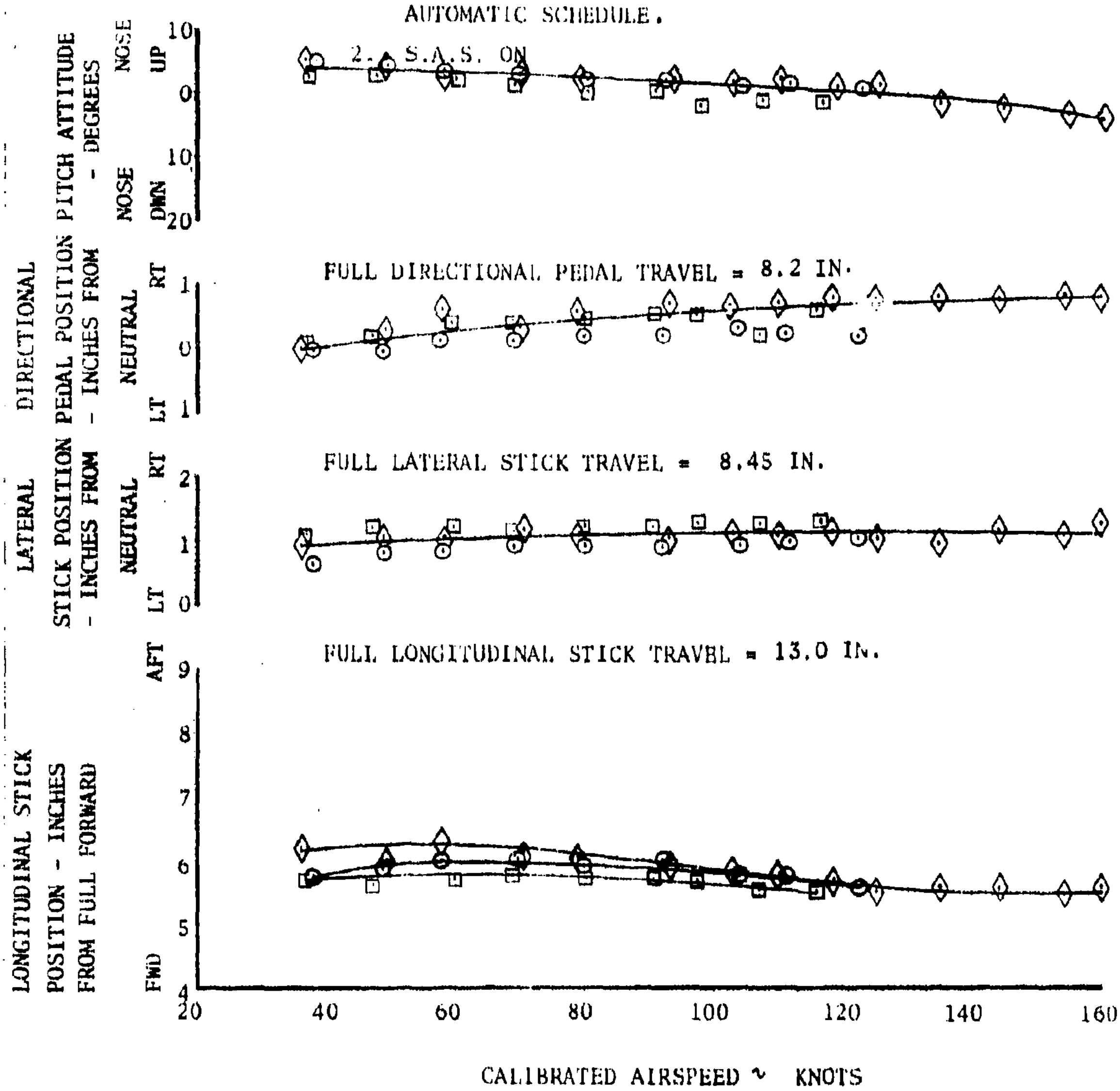


FIGURE NO. 127
TRIM CURVES IN LEVEL FLIGHT
CH-47B U.S.A. S/N 66-19100

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
⊙	~31420	1830	330.9(MID)	230
⊡	~31780	10010	330.8(MID)	230

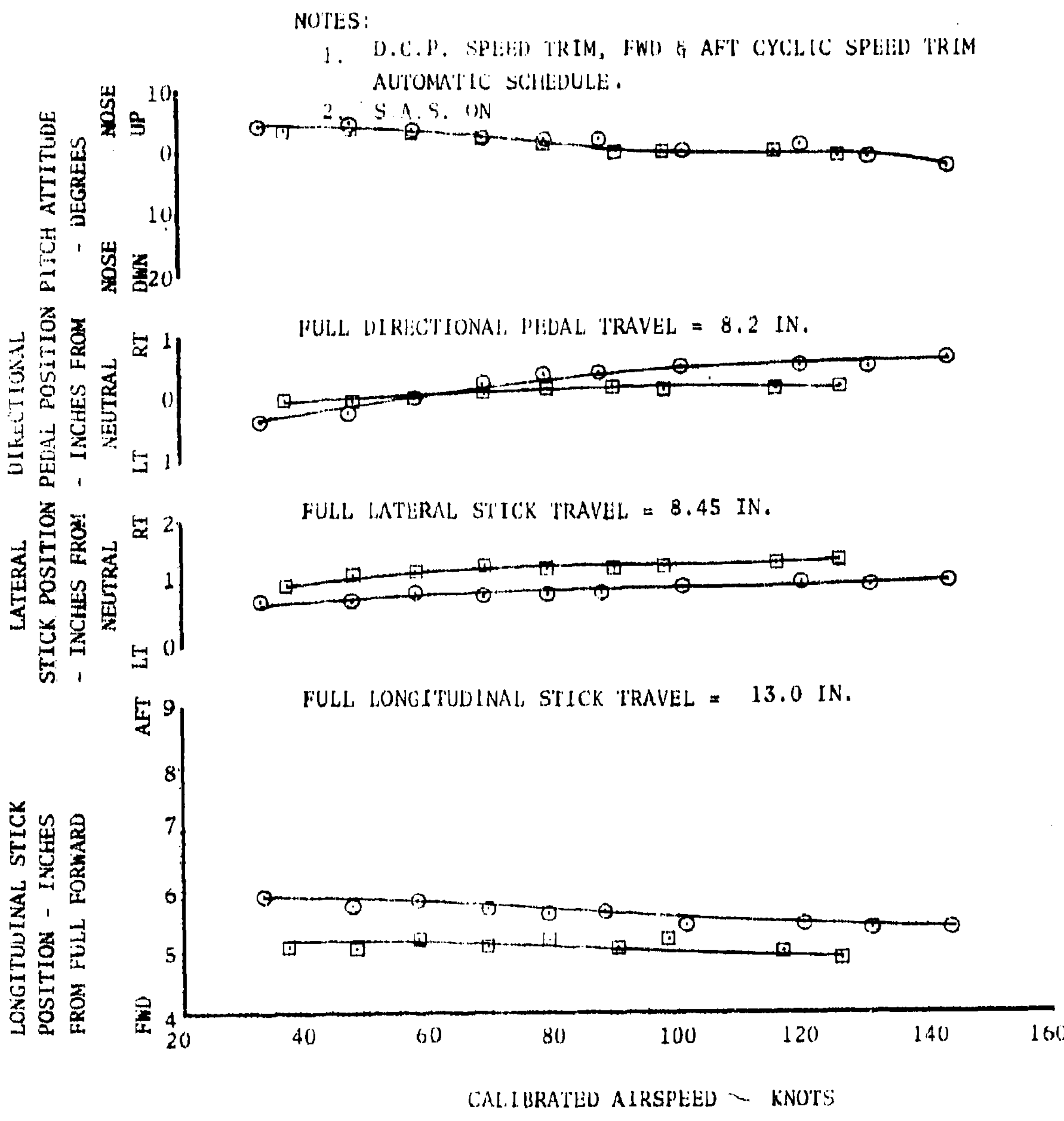


FIGURE NO. 128
TRIM CURVES IN LEVEL FLIGHT
CH-47B USA S/N 66-19100

SYM	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
○	38540	5620	330.1(MID)	230
□	38960	2010	331.2(MID)	230
◇	39770	680	330.0(MID)	230

1. DCP SPEED TRIM, FWD AND AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

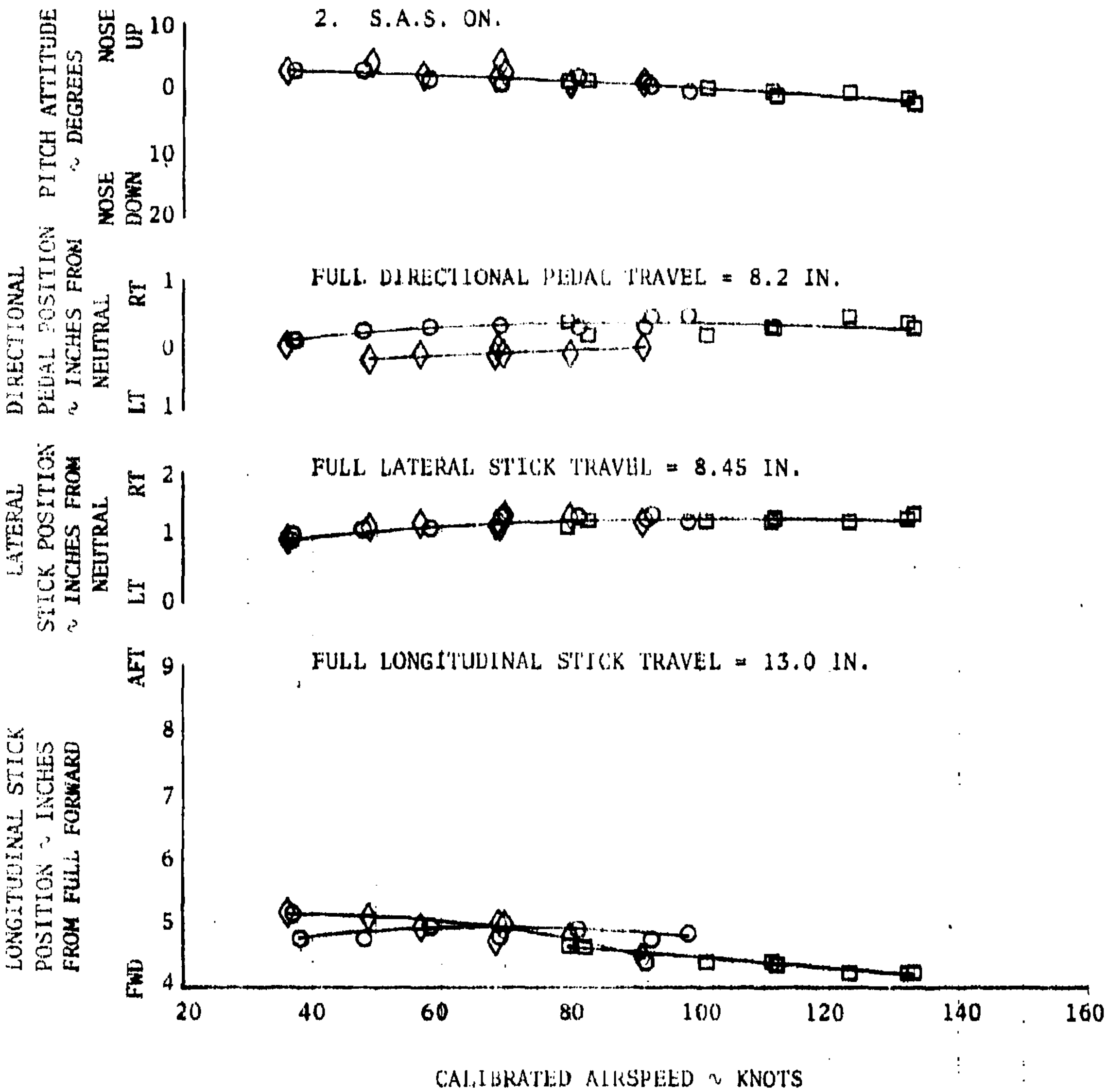


FIGURE NO. 129
TRIM CURVES IN LEVEL FLIGHT
CH-47B USA S/N 66-19100

SYM	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
○	26660	6460	330.6(MID)	230
□	38540	5620	330.1(MID)	230

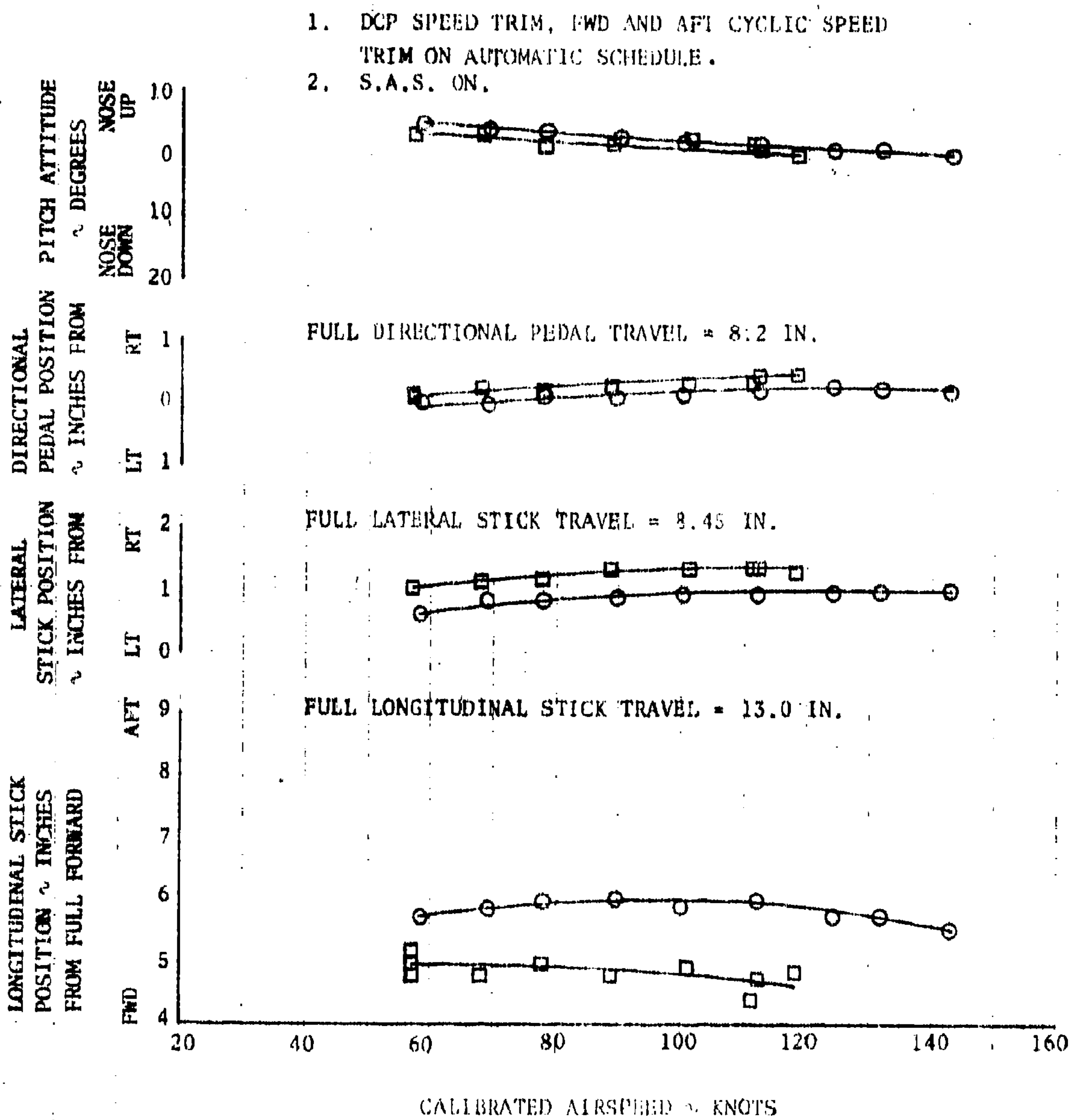


FIGURE NO. 130
TRIM CURVES IN LEVEL FLIGHT
CH-47B U.S.A. S/N 66-19100

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
⊙	~ 31420	1830	330.9 (MID)	230
⊡	~ 25910	1380	331.5 (MID)	230
◊	~ 38960	2010	331.2 (MID)	230
D	~ 39770	680	330.9 (MID)	230

NOTES:

1. D.C.P. SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON

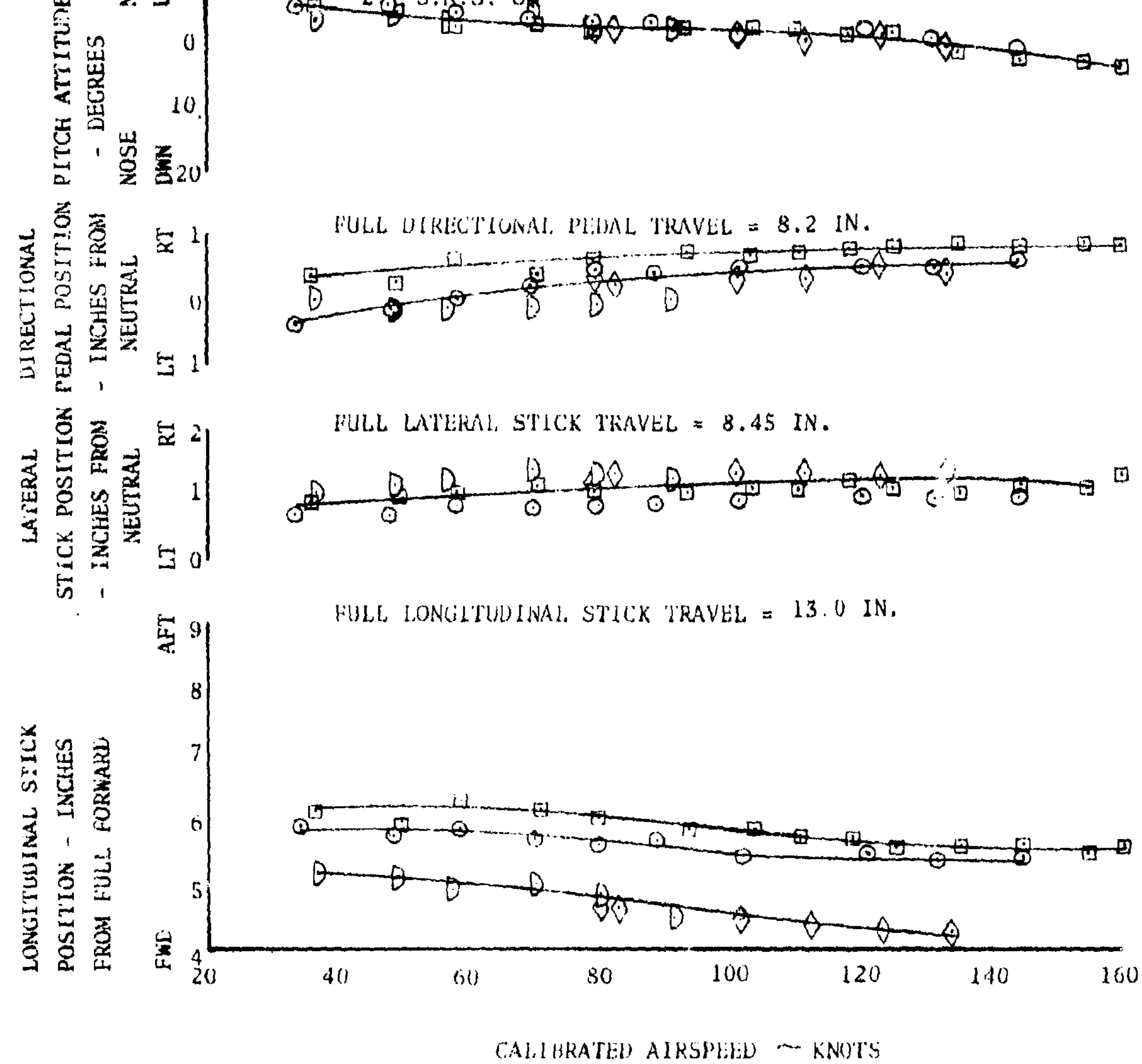


FIGURE NO. 131
TRIM CURVES IN LEVEL FLIGHT

CH-47B U.S.A. S/N 66-19100

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
⊙ ~	30130	5820	331.1(MID)	225
⊡ ~	36280	5600	331.9(MID)	225

NOTES:

1. D.C.P. SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

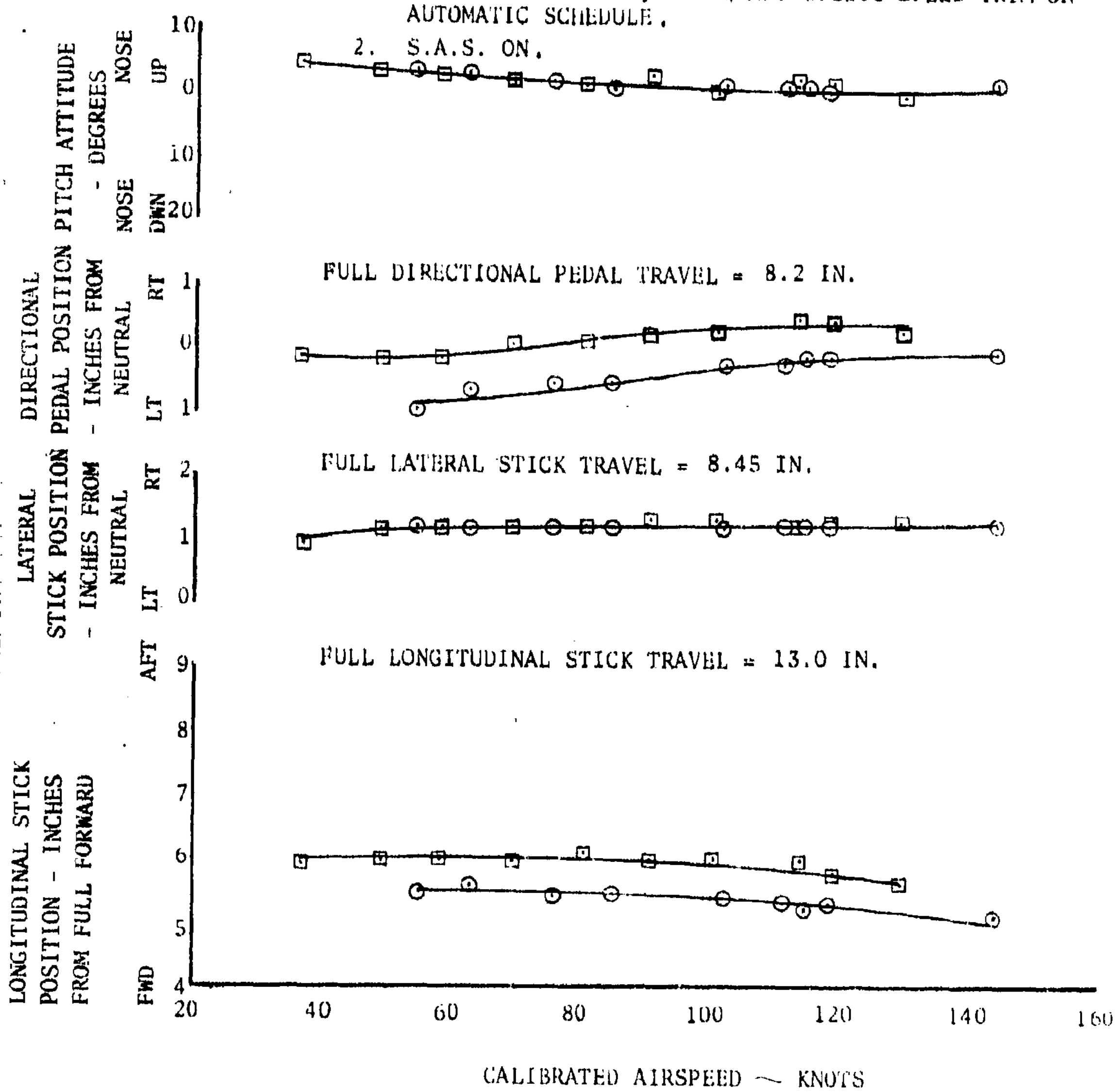


FIGURE NO. 132
TRIM CURVES IN LEVEL FLIGHT
CH-47B USA S/N 66-19100

SYM	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
○	31780	10010	330.9(MID)	230
□	28580	10050	330.5(MID)	230
△	35800	10000	331.0(MID)	230
◇	25830	11520	330.9(MID)	230

1. DCP SPEED TRIM, FWD AND AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

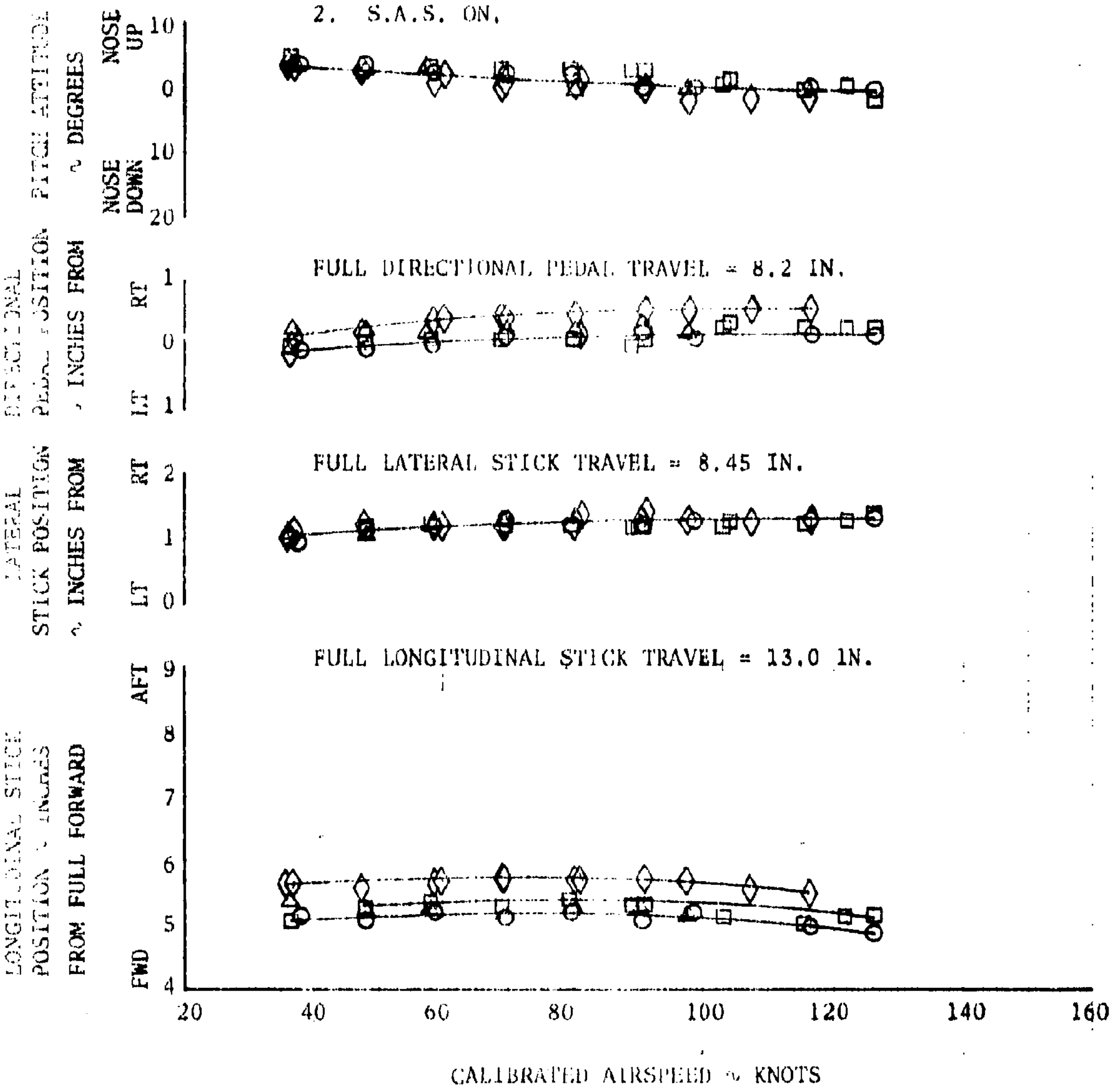


FIGURE NO. 133

TRIM CURVES IN LEVEL FLIGHT

CH-47B U.S.A. S/N 66-19100

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
⊙ ~	36280	5600	331.9(MID)	225
⊡ ~	38540	5620	330.1(MID)	230

NOTES:

1. D.C.P. SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

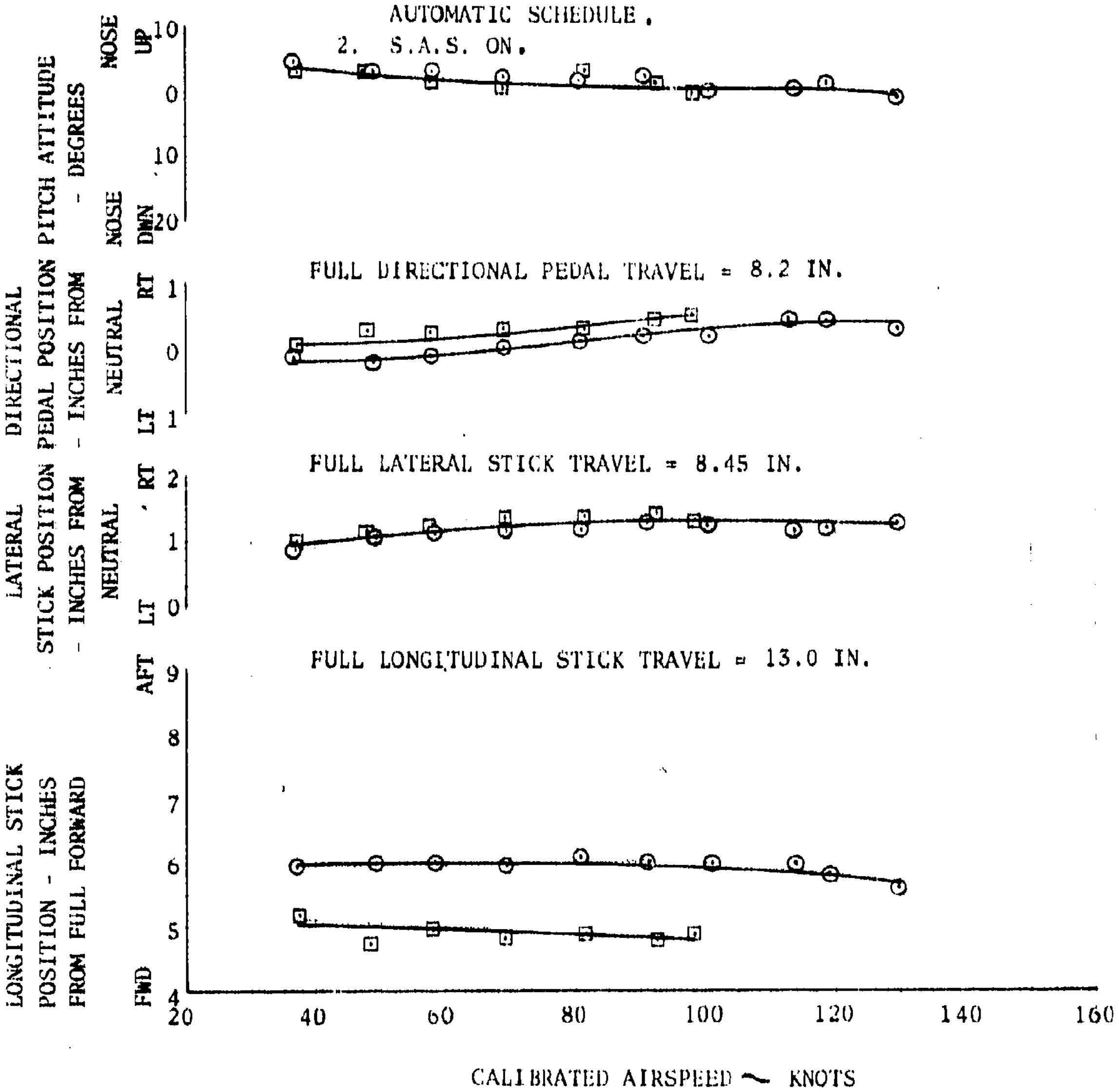


FIGURE NO. 134
TRIM CURVES IN LEVEL FLIGHT
CH-47B USA S/N 66-19100

SYM	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
○	36280	5600	331.9(MID)	225
□	35200	1020	330.8(MID)	225

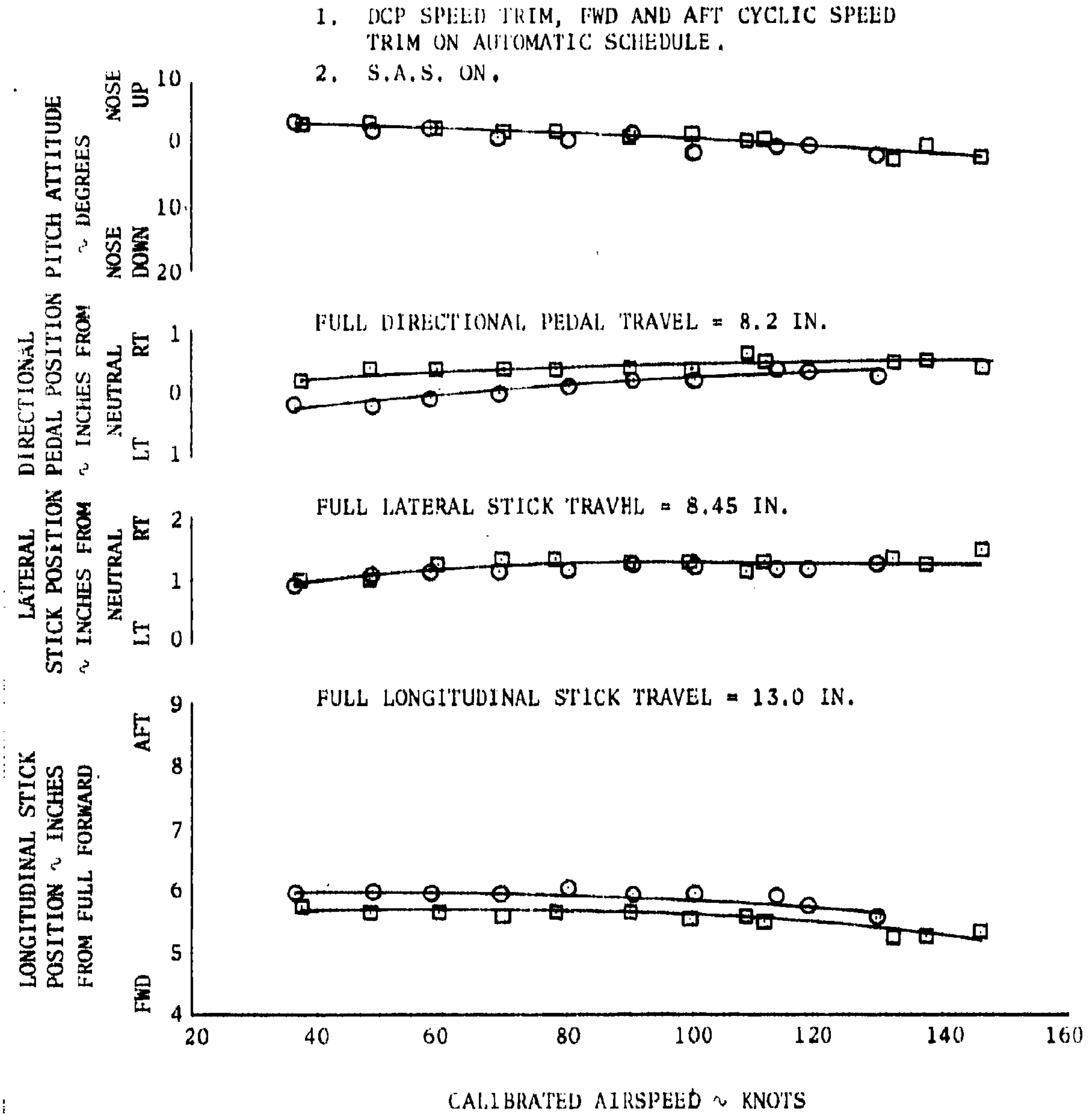


FIGURE NO. 135
TRIM CURVES IN LEVEL FLIGHT
CH-47B USA S/N 66-19100

SYM	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
○	28830	3910	330.0(MID)	225
□	25910	1380	331.6(MID)	230

1. DCP SPEED TRIM, FWD AND AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

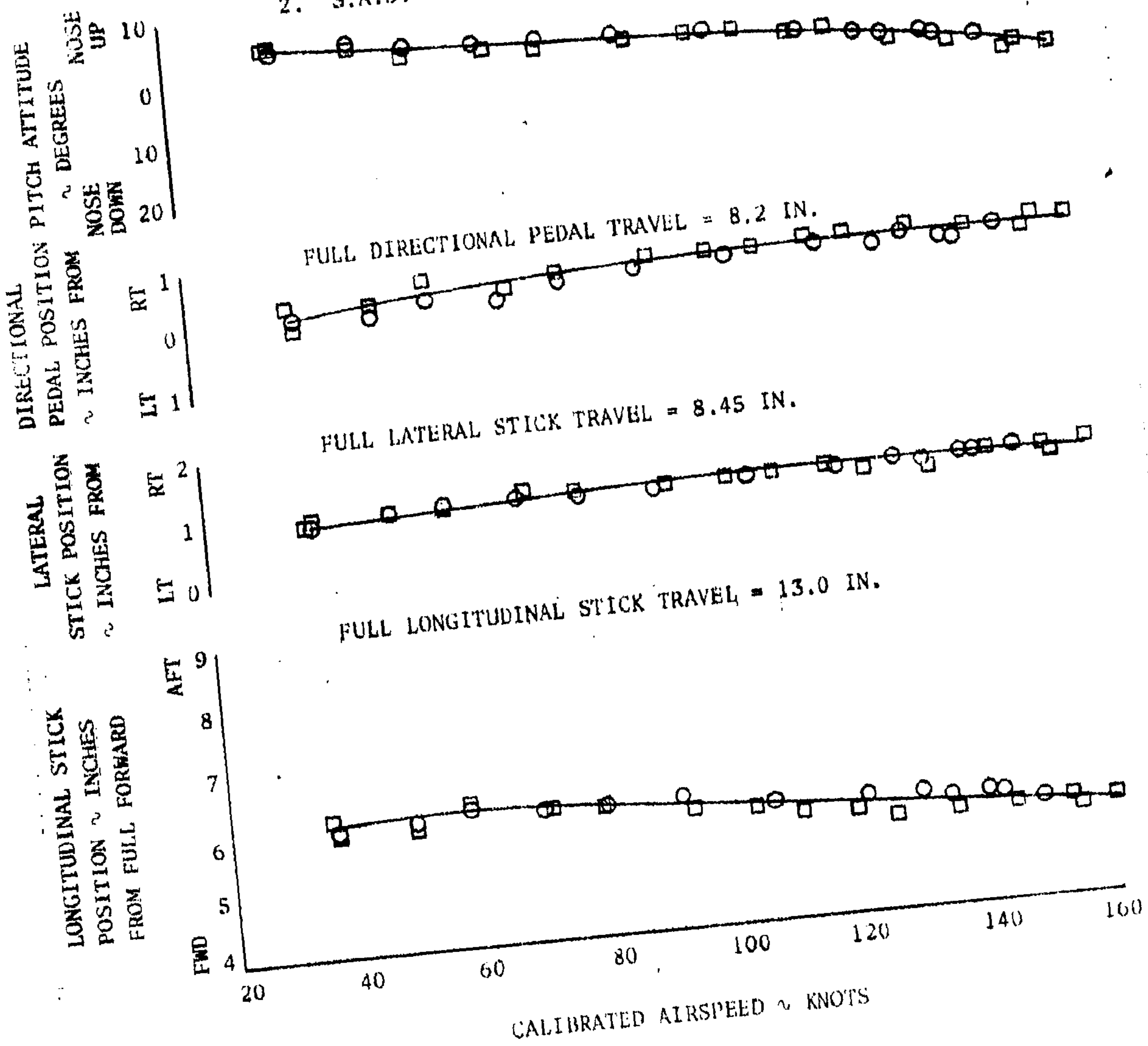


FIGURE NO. [illegible]

STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY

CH-47B U.S.A. S/N 66-19100

AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
33000	2000	330.8 (MID)	230

NOTES:

1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

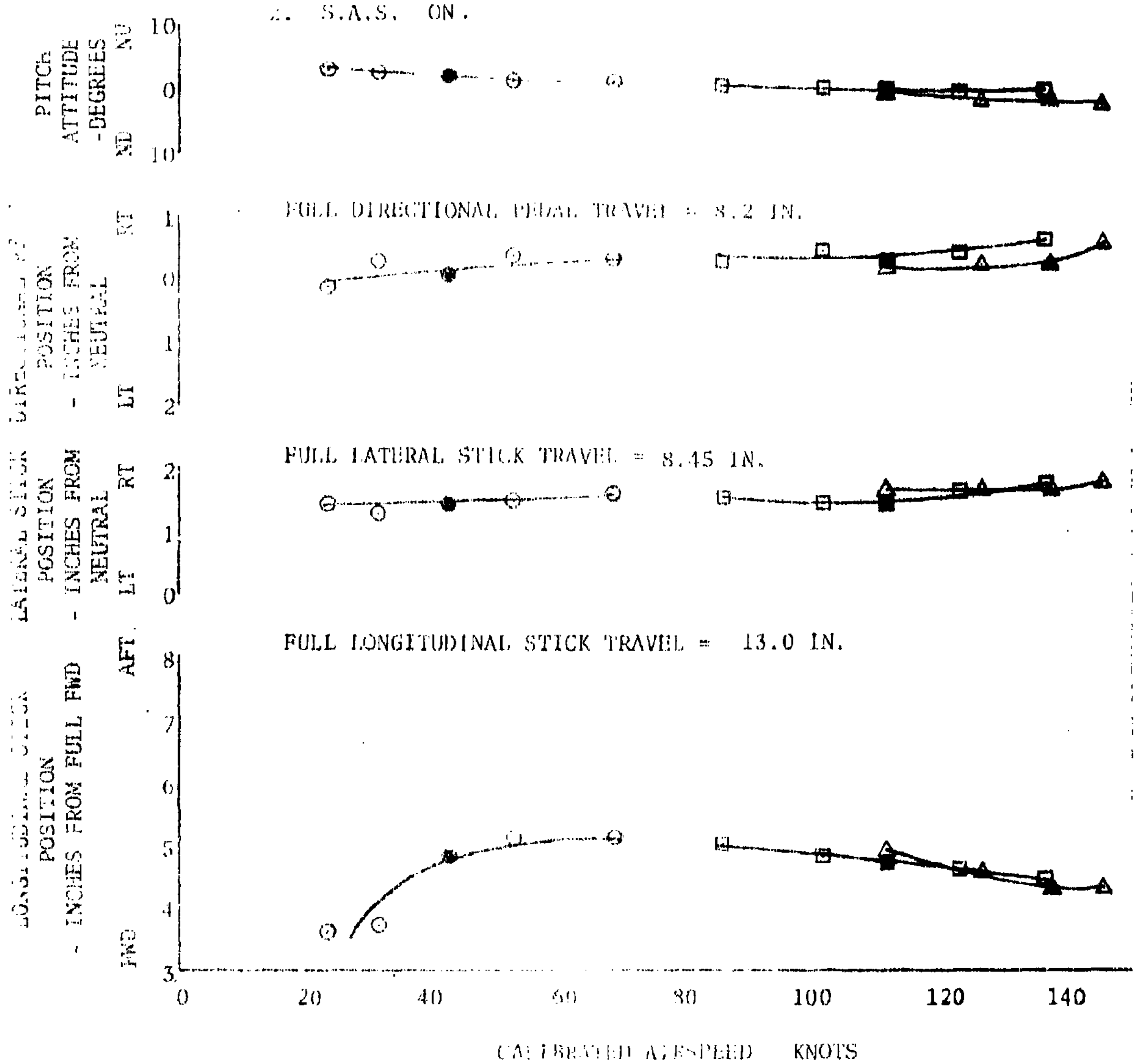


FIGURE NO. 137
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100

LEVEL FLIGHT

AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
33000	5000	330.9(MID)	225

NOTES:
1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

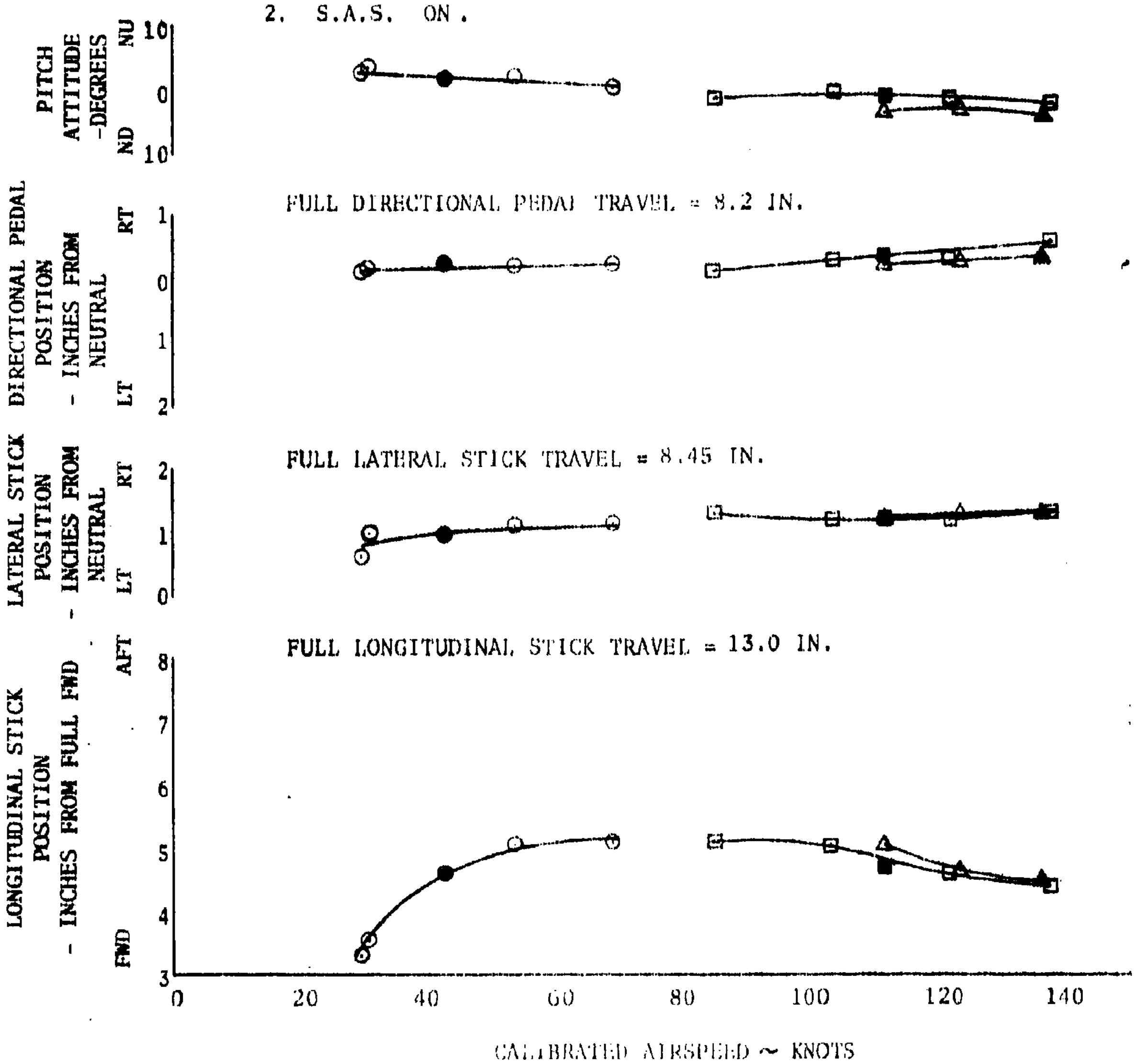


FIGURE NO. 138
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

AVG. GROSS WEIGHT LB	AVG. DENSITY ALTITUDE FT	AVG. C.G. IN	AVG. ROTOR SPEED R.P.M.
33000	5000	311.6(FWD)	225

NOTES:

1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

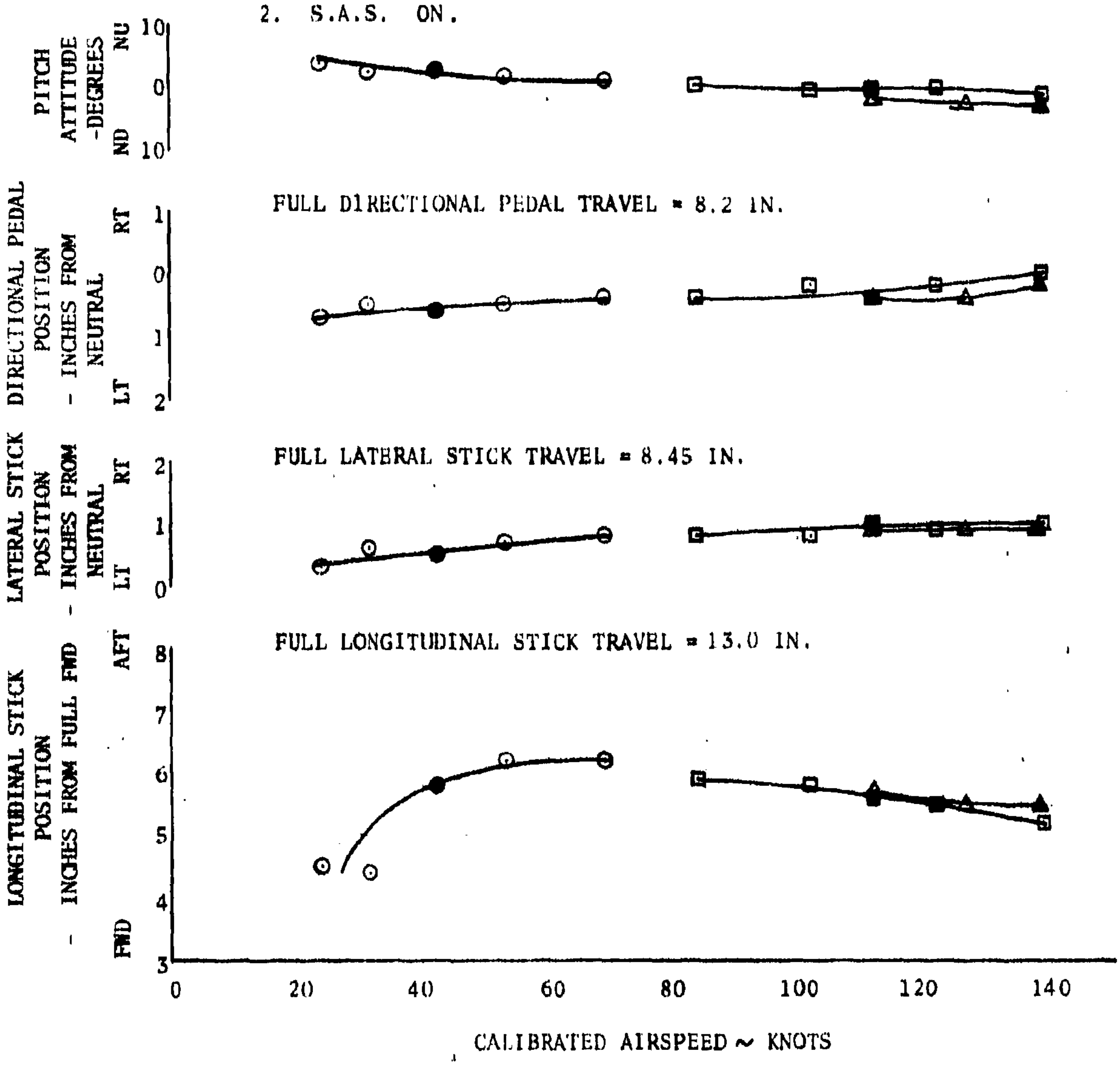
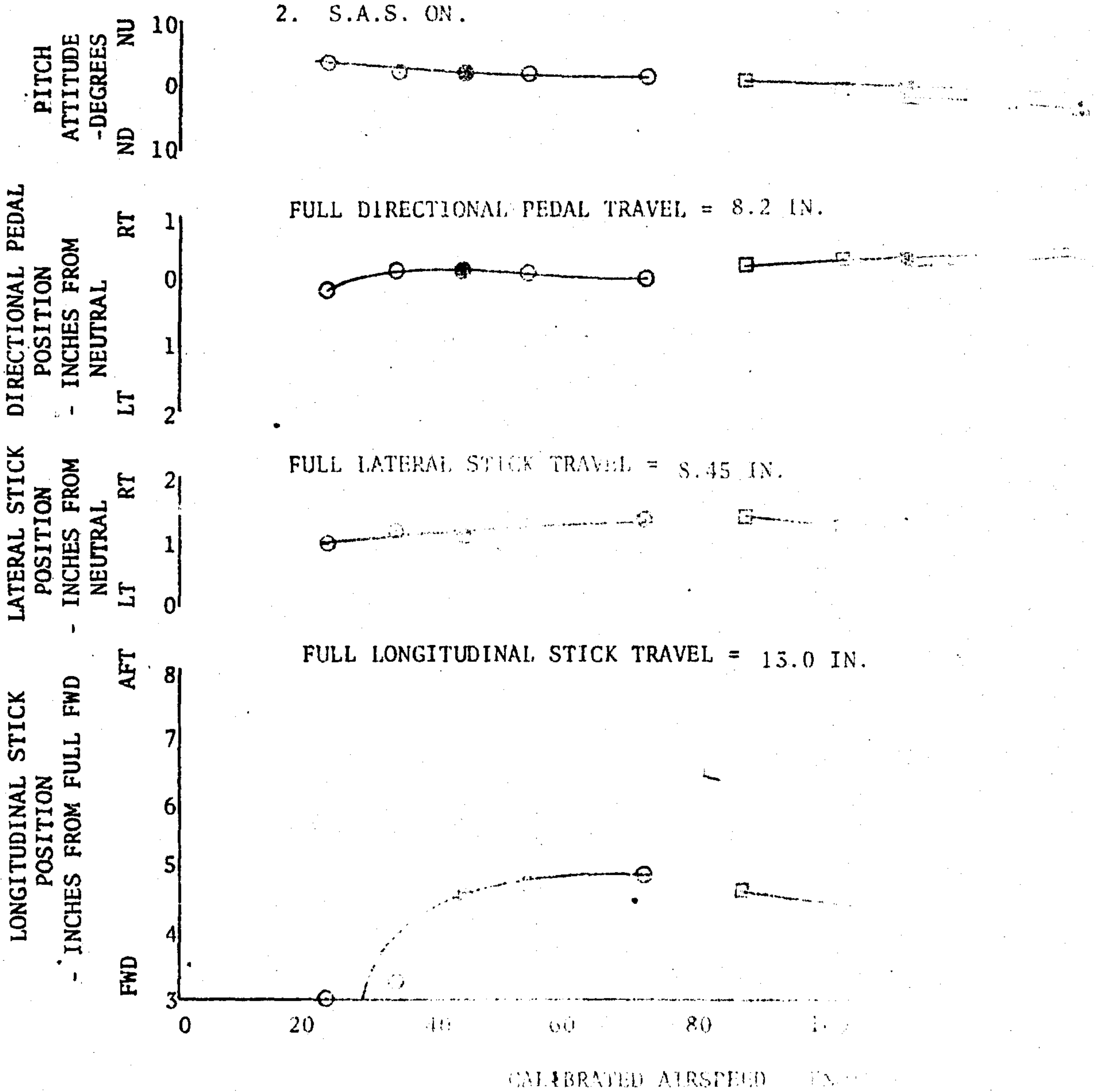


FIGURE NO. 139
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100

LEVEL FLIGHT

AVG. GROSS WEIGHT LB	AVG. DENSITY ALTITUDE FT	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
33000	5000	337.4(AFT)	225

NOTES:
1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.



Best Available Copy

FIGURE NO. 140
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100

LEVEL FLIGHT

AVG. GROSS WEIGHT LB	AVG. DENSITY ALTITUDE FT	AVG. C.G. IN	AVG. ROTOR SPEED R.P.M.
40000	5000	329.6(MID)	230

NOTES:
1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

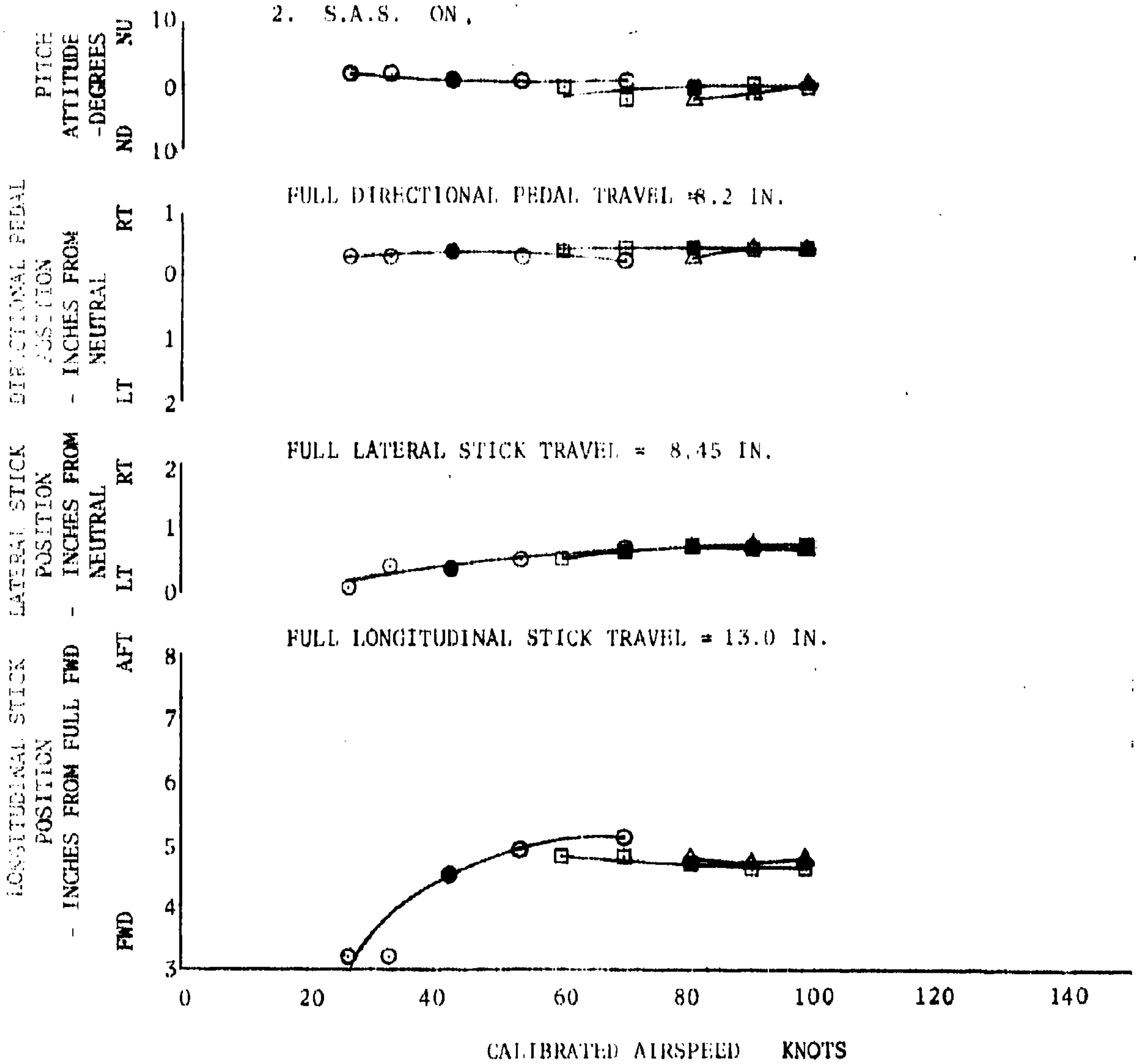


FIGURE NO. 141

STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY

CH-47B U.S.A. S/N 66-19100

CLIMB

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
O	33000	5000	330.8 (MID)	230

NOTES:

1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

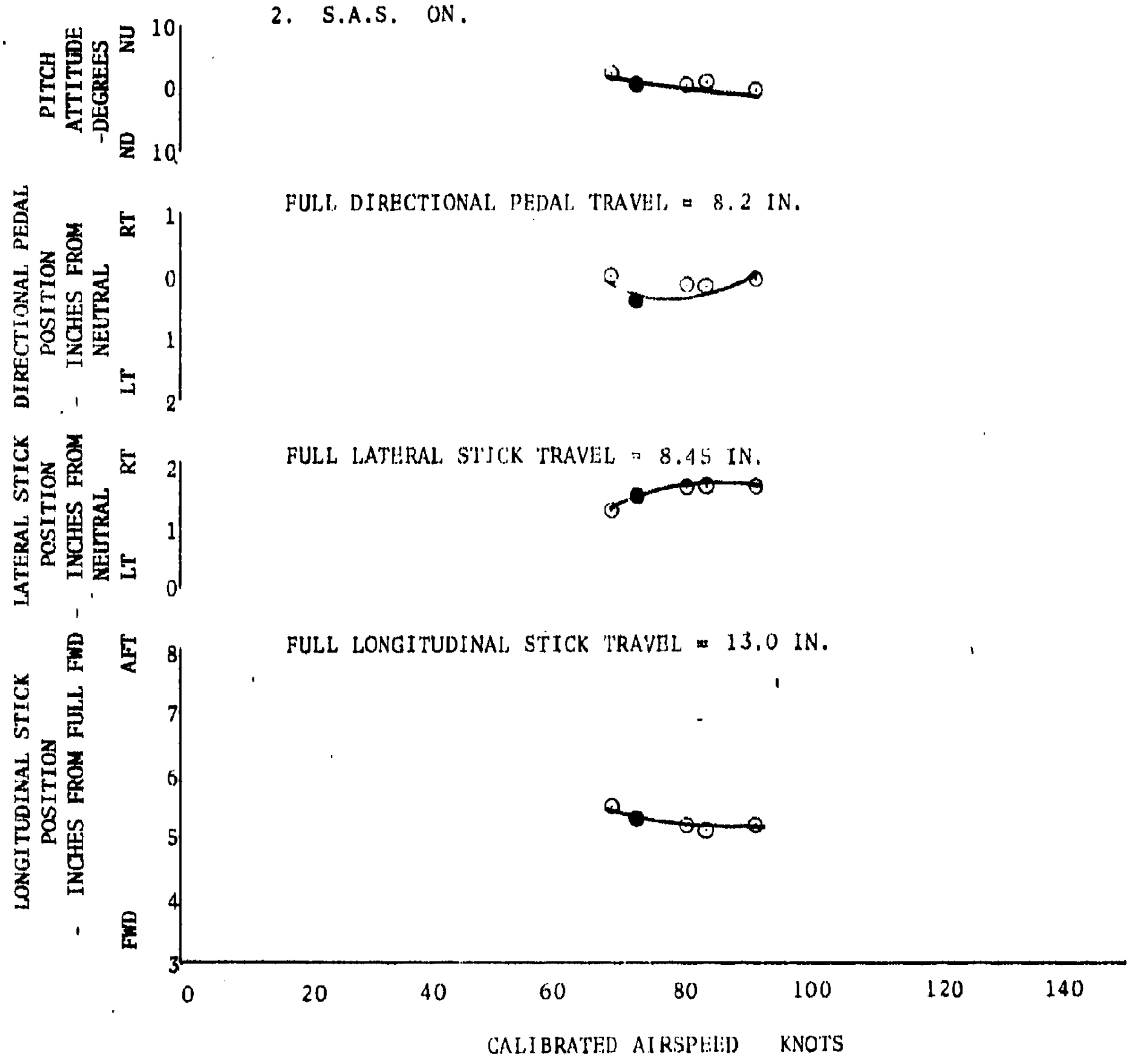


FIGURE NO. 142
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100
CLIMB

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
O	33000	5000	330.9 (MID)	225

NOTES:
1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

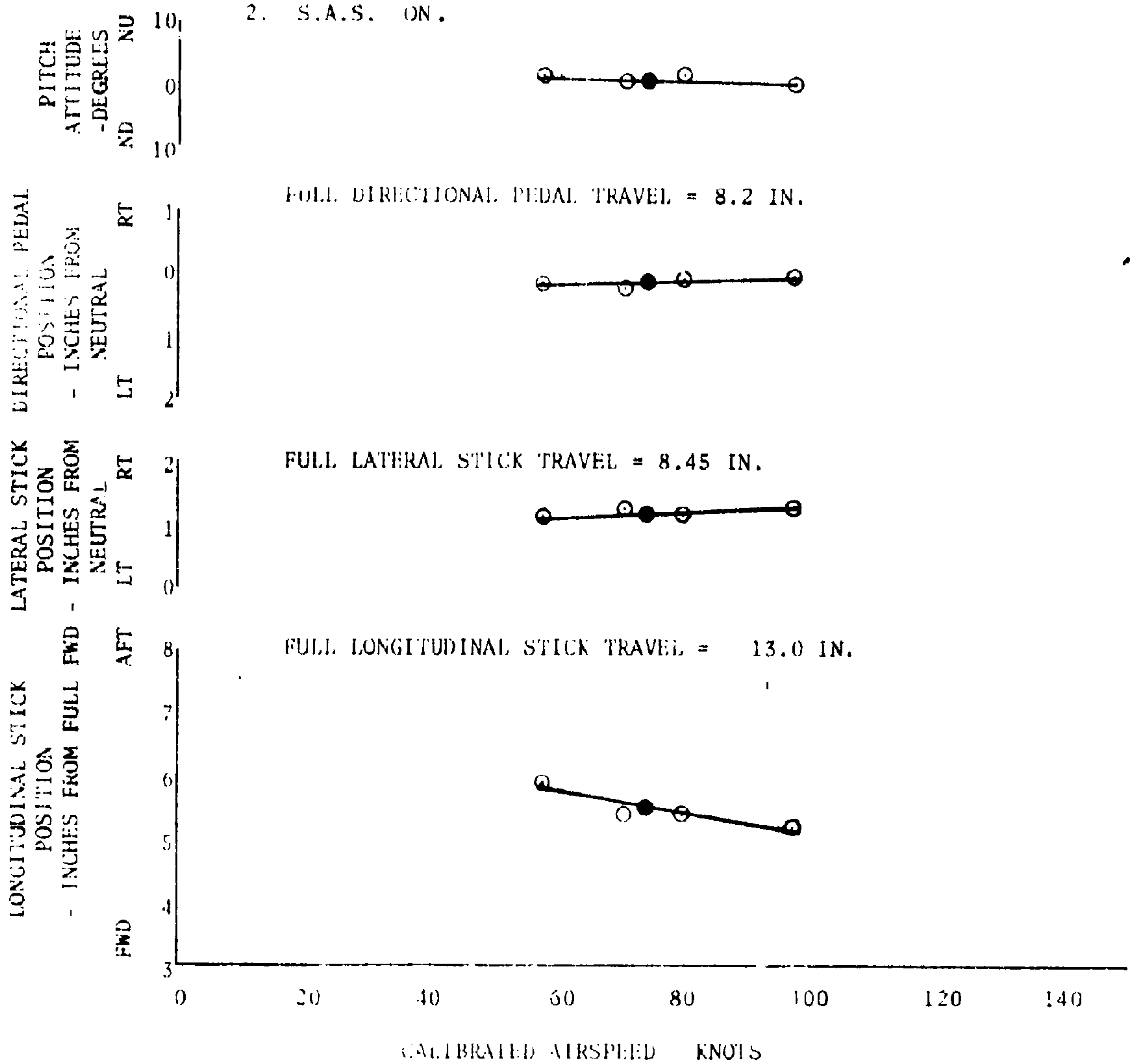


FIGURE NO. 143
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100
CLIMB

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
○	33000	10000	330.9(MID)	225

NOTES:

1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

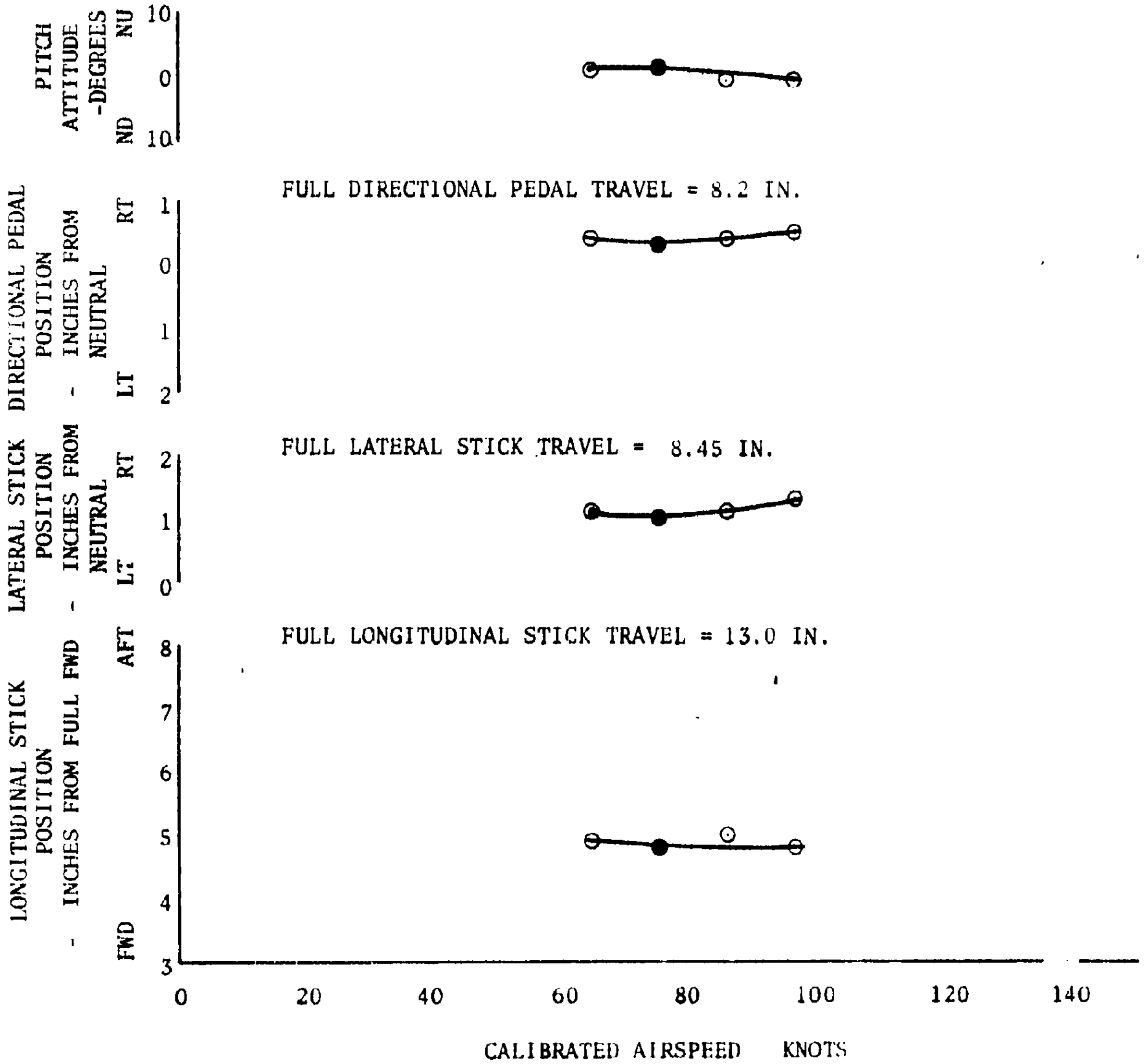


FIGURE NO. 144
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100

CLIMB

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
ʘ	33000	5000	337.4(AFT)	225

NOTES:
1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

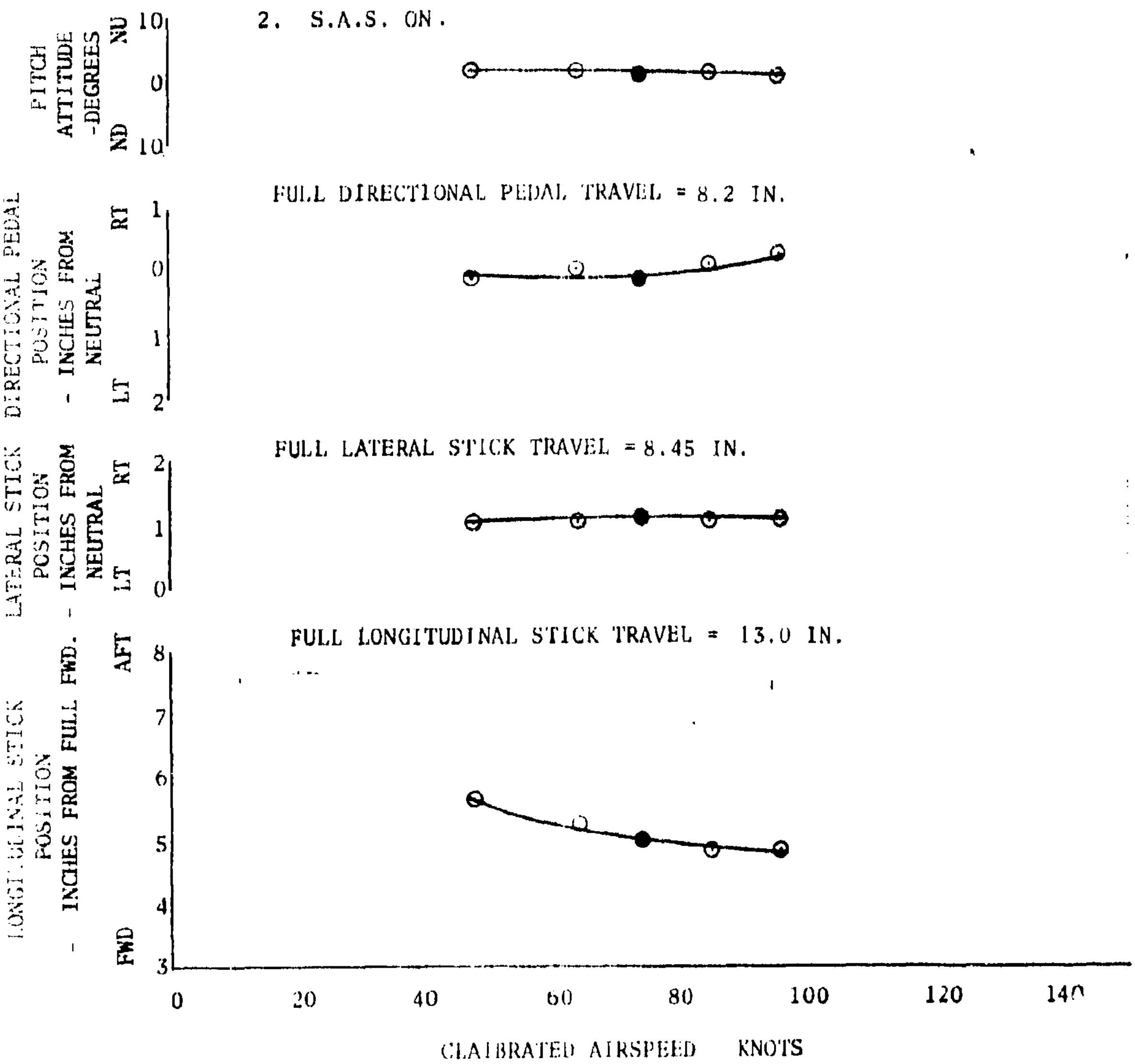


FIGURE NO. 145
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100
CLIMB

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
O	33000	5000	311.6(FWD)	225

NOTES:
1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

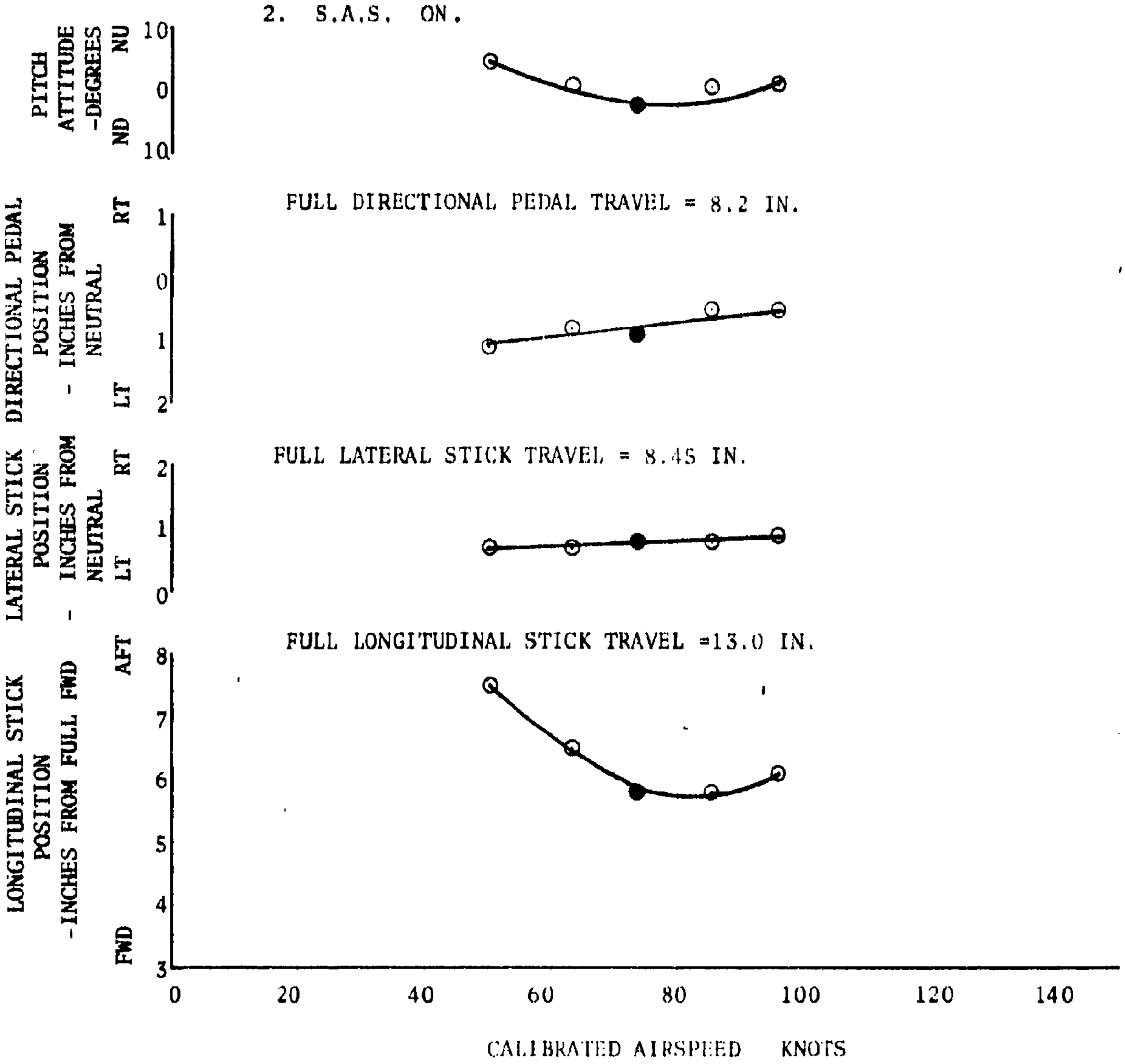


FIGURE NO. 146
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 19100

CLIMB

SYM.	AVG. GROSS WEIGHT LB	AVG. DENSITY ALTITUDE FT	AVG. C.G. IN	AVG. ROTOR SPEED R.P.M.
O	40000	5000	329.6(MID)	230

NOTES:
1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

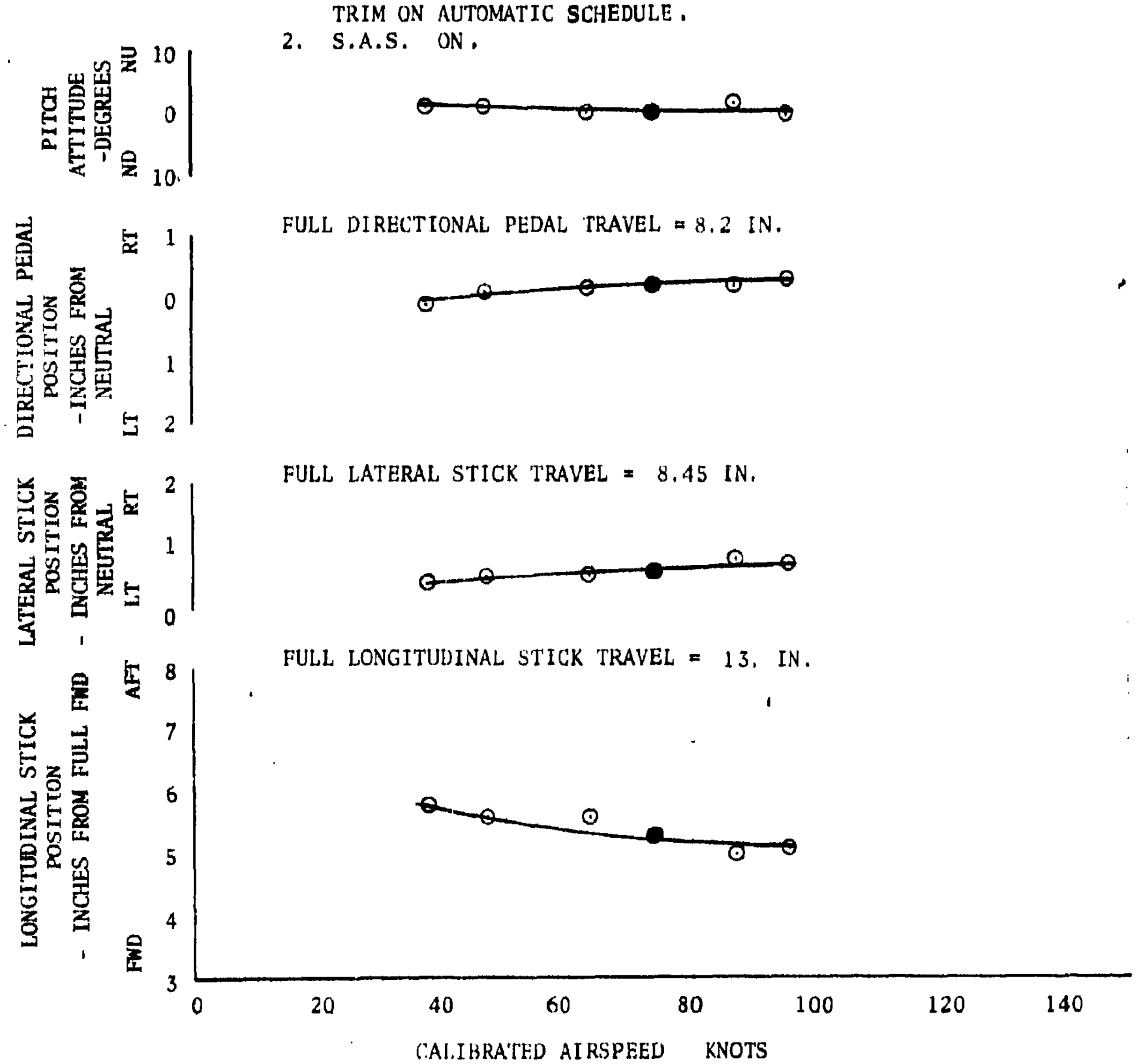


FIGURE NO. 147
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100

PARTIAL POWER DESCENT

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
O	33000	5000	330.8 (MID)	230

NOTES:
1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

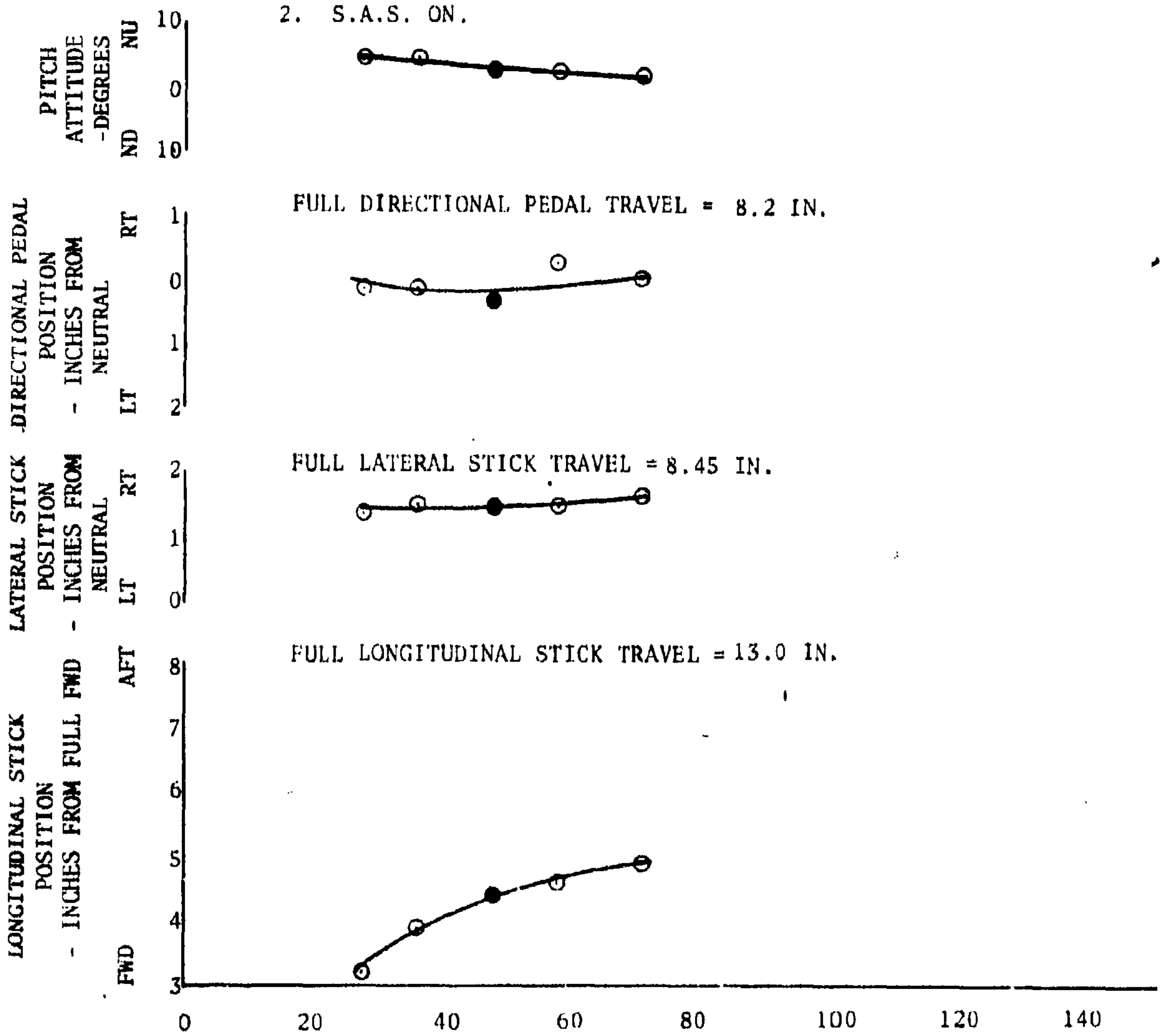


FIGURE NO. 148
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100
PARTIAL POWER DESCENT

SYM.	AVG. GROSS WEIGHT LB	AVG. DENSITY ALTITUDE FT	AVG. C.G. IN	AVG. ROTOR SPEED R.P.M.
O	33000	10000	330.9(MID)	225

NOTES:
1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

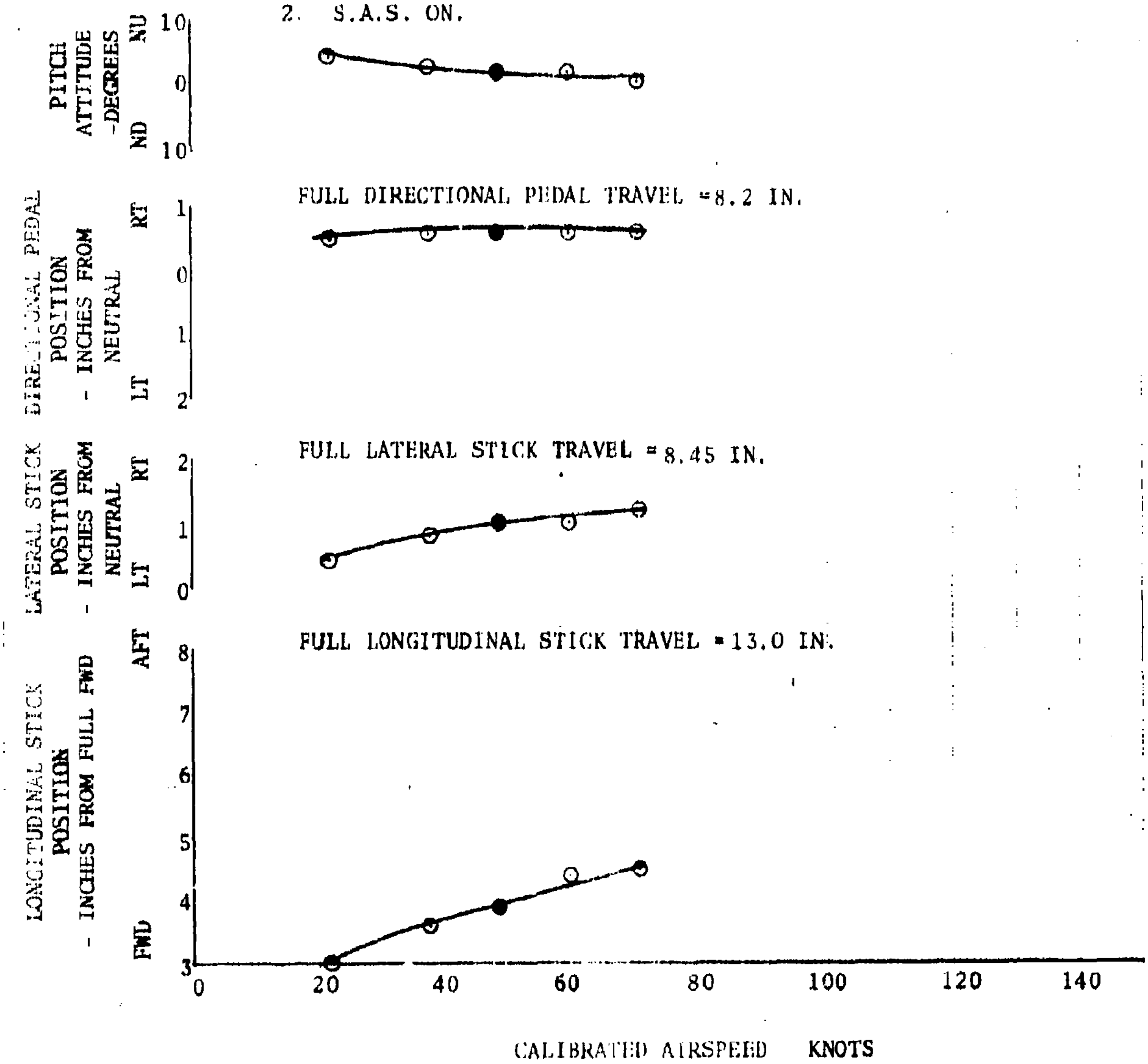


FIGURE NO 149
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100

PARTIAL POWER DESCENT

SYM.	AVG. GROSS WEIGHT LB	AVG. DENSITY ALTITUDE FT	AVG. C.G. IN	AVG. ROTOR SPEED R.P.M.
O	33000	5000	330.9(MID)	225

NOTES:

1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

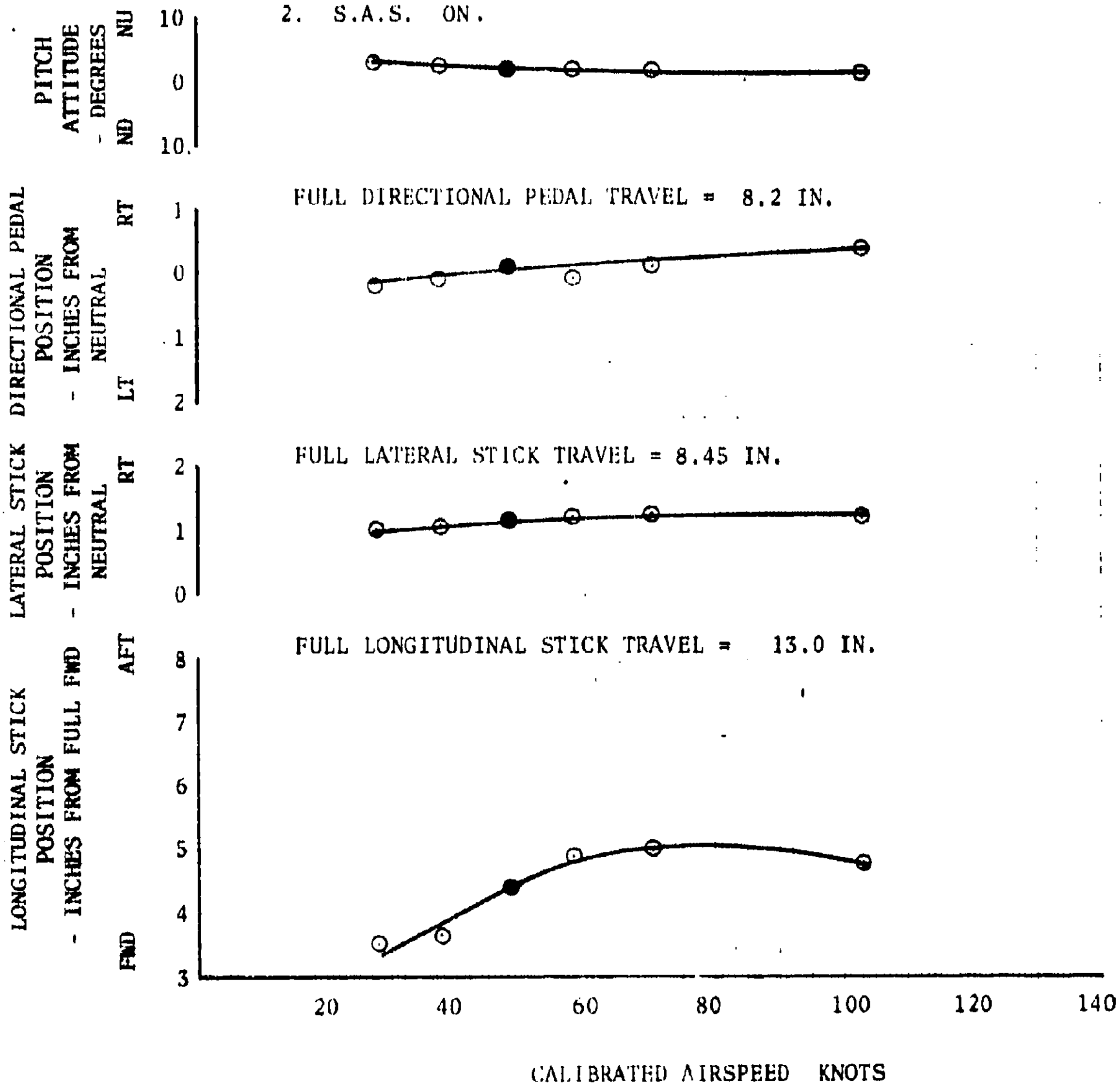


FIGURE NO. 150

STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY

CH-47B U.S.A. S/N 66-19100

PARTIAL POWER DESCENT

SYM.	AVG. GROSS WEIGHT LB	AVG. DENSITY ALTITUDE FT	AVG. C.G. IN	AVG. ROTOR SPEED R.P.M.
O	33000	5000	311.6(FWD)	225

NOTES:

1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

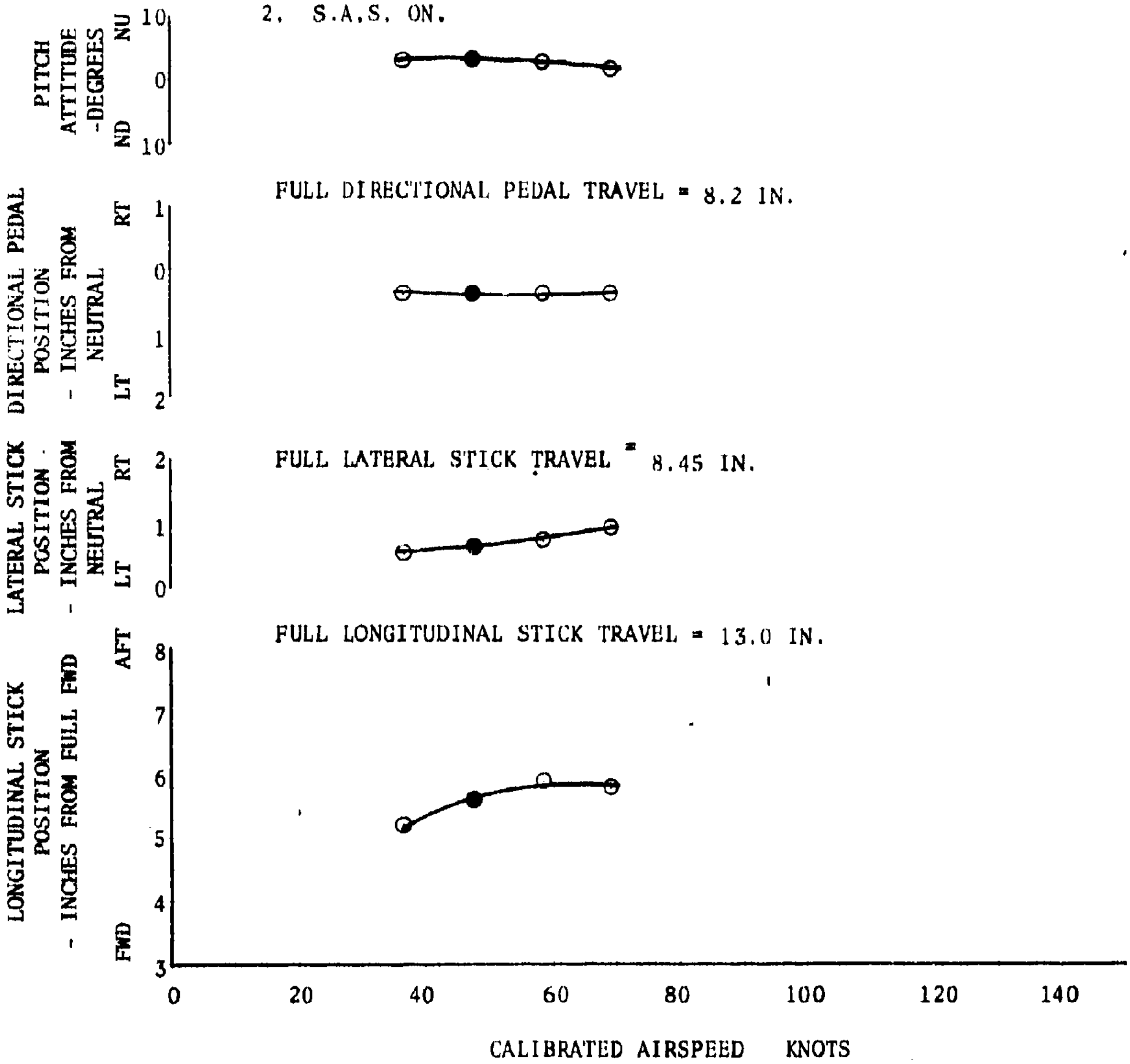


FIGURE NO. 151
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100
PARTIAL POWER DESCENT

SYM	AVG. GROSS WEIGHT LB	AVG. DENSITY ALTITUDE FT	AVG. C.G. IN	AVG. ROTOR SPEED R.P.M.
O	33000	5000	337.4(AFT)	225

NOTES:
1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

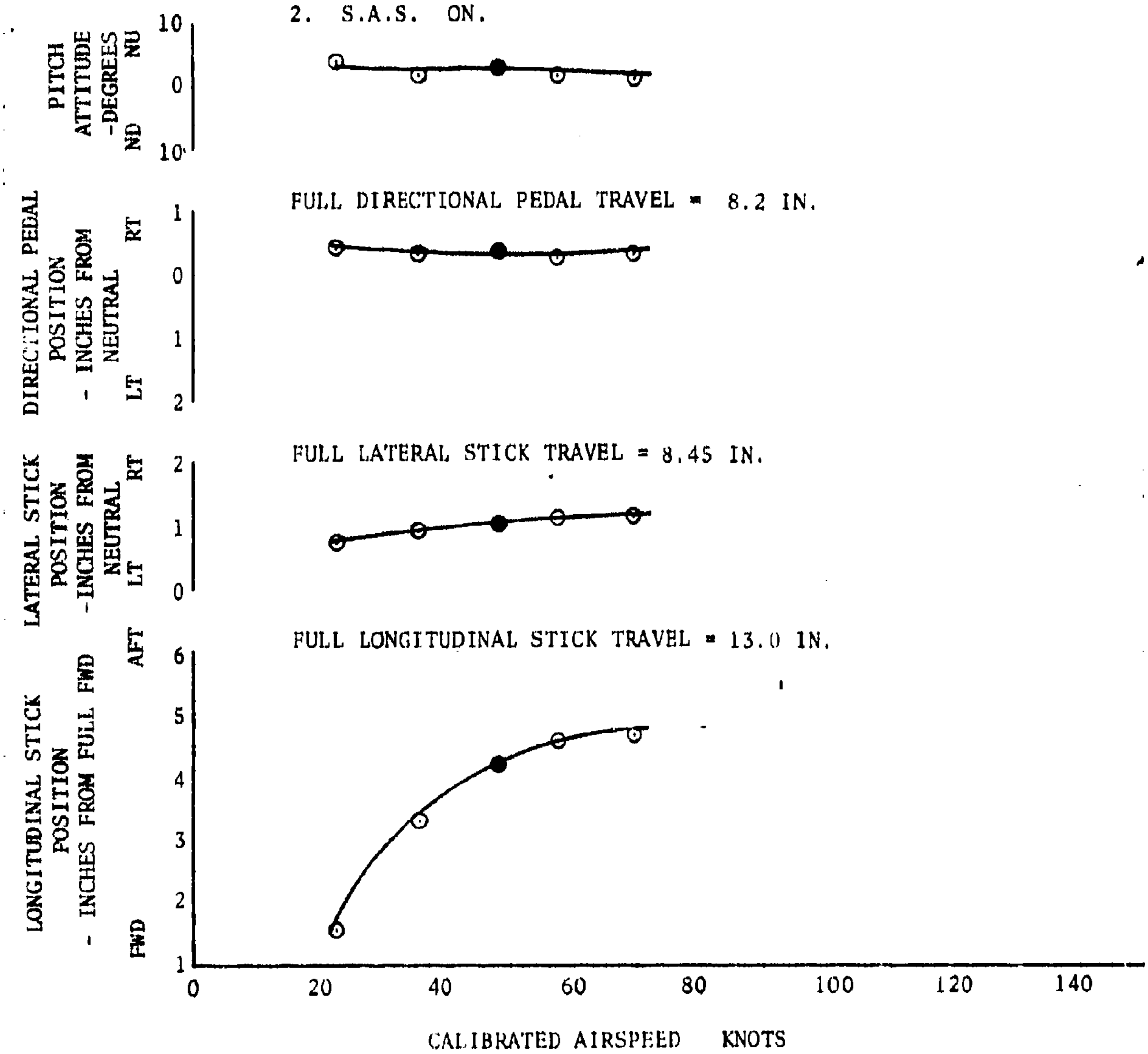


FIGURE NO. 152
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100

PARTIAL POWER DESCENT

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
○	40000	5000	329.6(MID)	230

NOTES:
1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

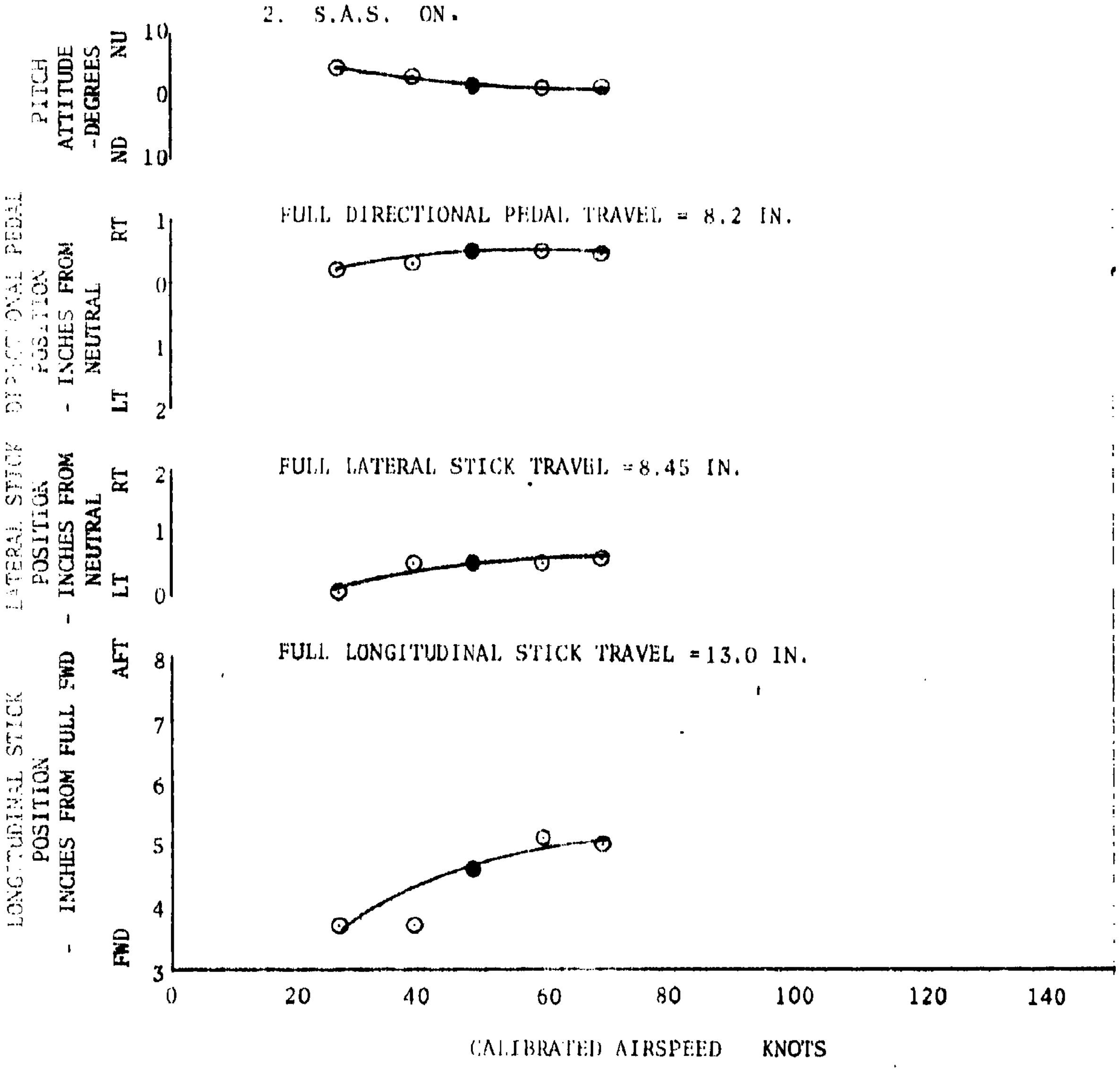


FIGURE NO. 153
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100

AUTOROTATION

SYM.	AVG. GROSS WEIGHT LB	AVG. DENSITY ALTITUDE FT	AVG. C.G. IN	AVG. ROTOR SPEED R.P.M.
O	33000	5000	330.9(MID)	225

NOTES:
1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

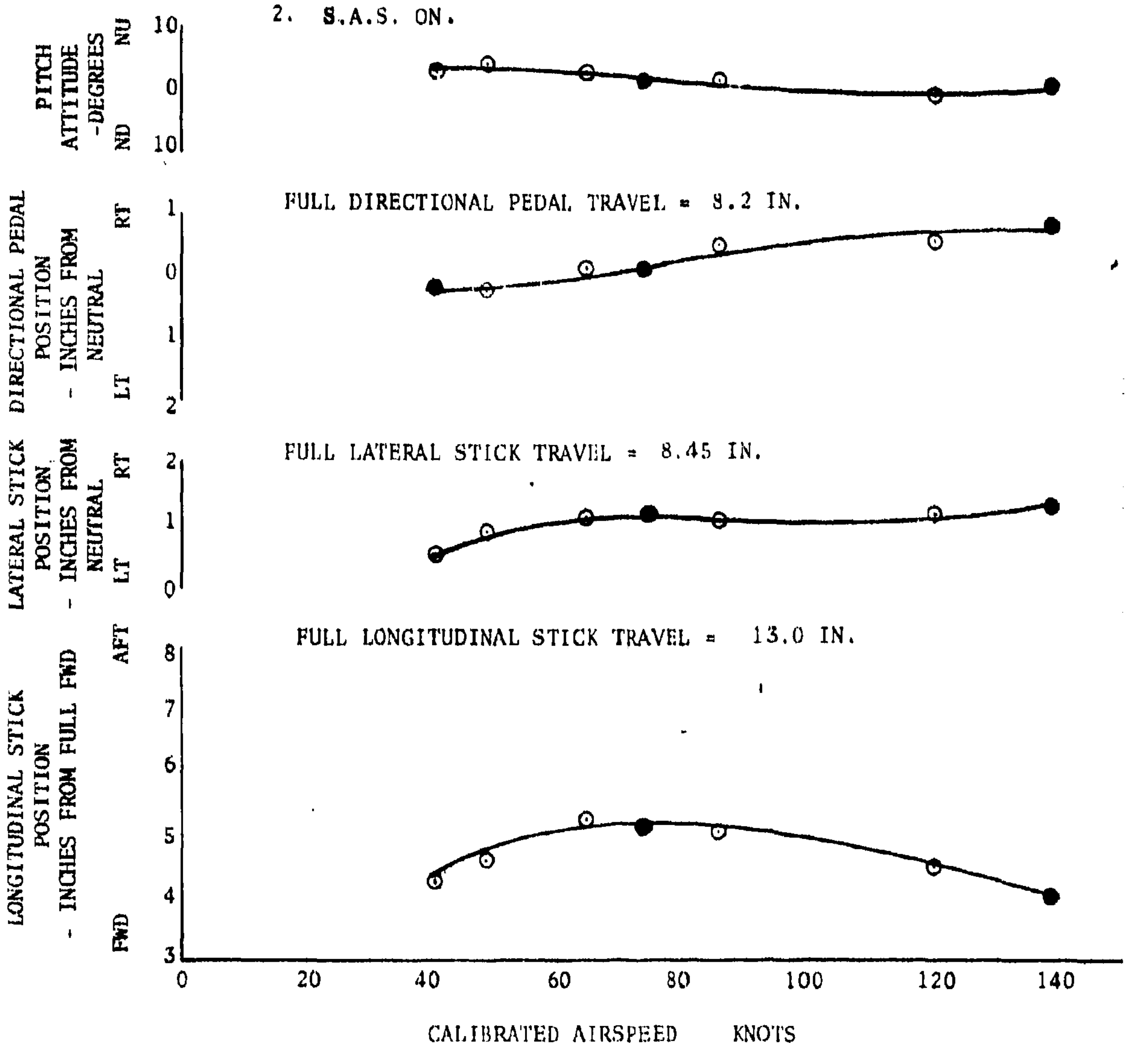


FIGURE NO. 154
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47 U.S.A. S/N 66-19100
AUTOROTATION

SYM.	AVG. GROSS WEIGHT LB	AVG. DENSITY ALTITUDE FT	AVG. C.G. IN	AVG. ROTOR SPEED R.P.M.
O	33000	10000	330.9(MID)	225

NOTES:
1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

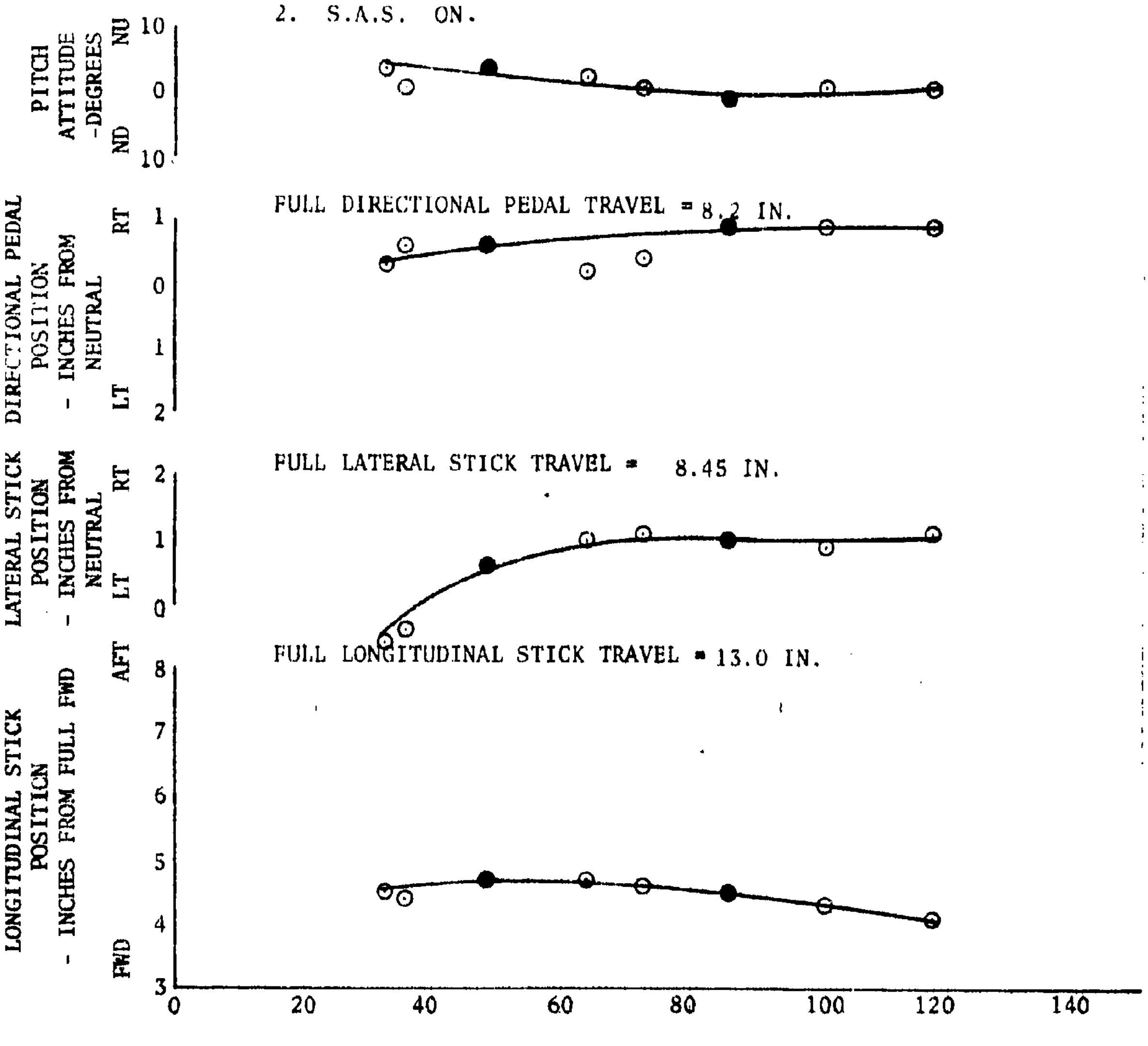


FIGURE NO. 155
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A S/N 66-19100
AUTOROTATION

SYM.	AVG. GROSS WEIGHT LB	AVG. DENSITY ALTITUDE FT	AVG. C.G. IN	AVG. ROTOR SPEED R.P.M.
○	33000	5000	311.6(FWD)	225

NOTES:

1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

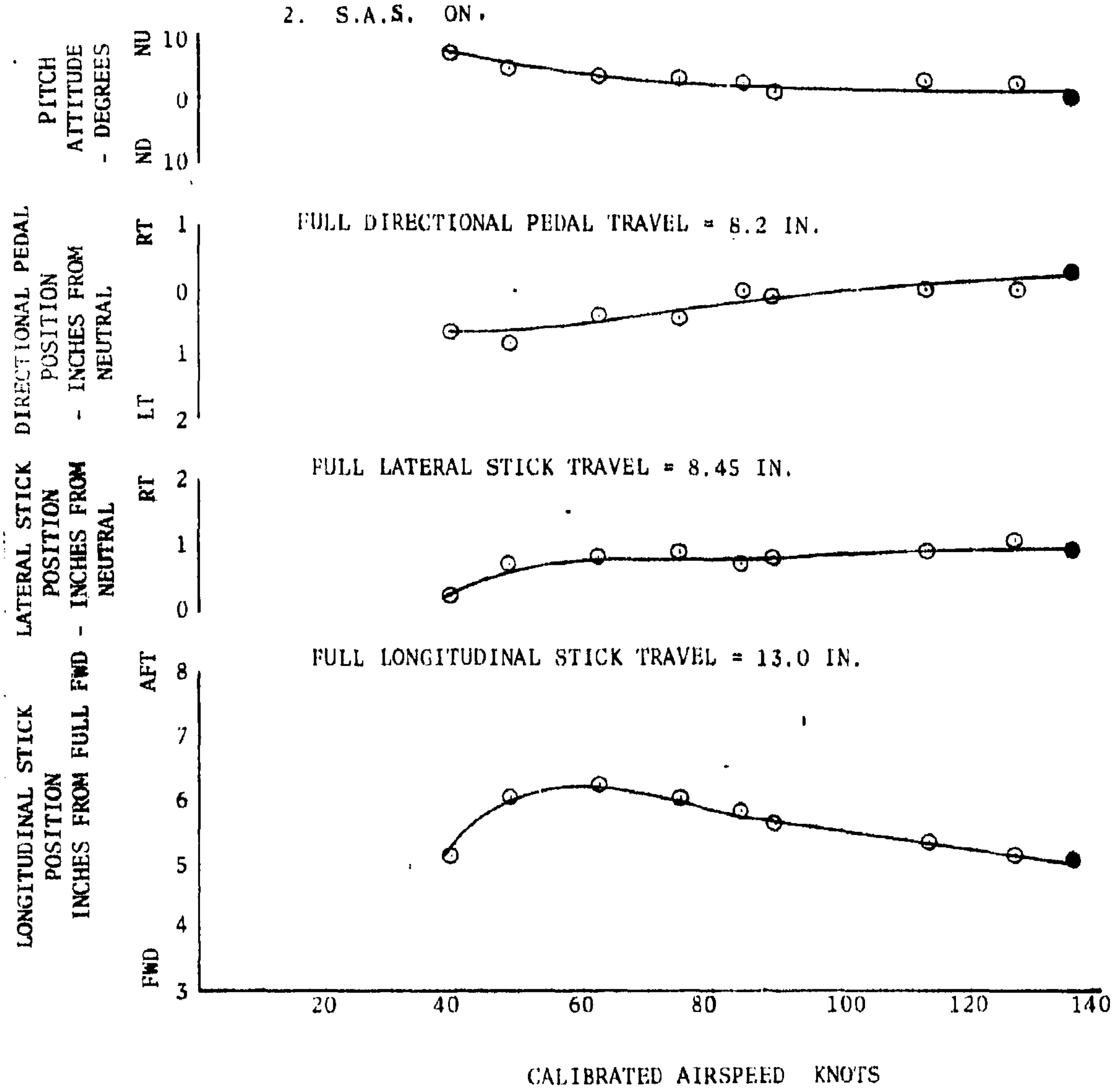


FIGURE NO. 156
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100
AUTOROTATION

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT	AVG. C.G. IN	AVG. ROTOR SPEED R.P.M.
O	33000	5000	337.4(AFT)	225

NOTES:

1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

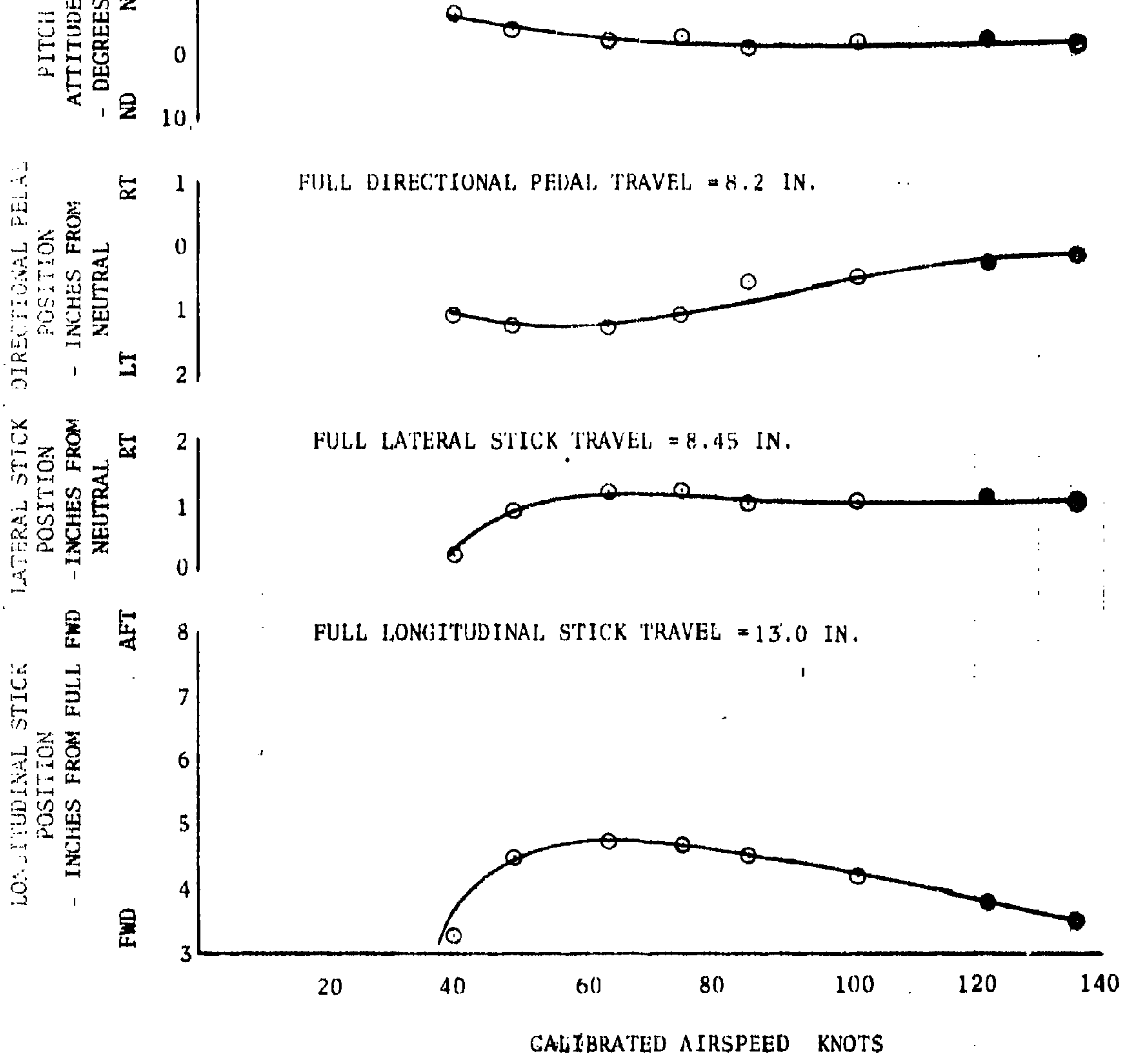


FIGURE NO. 157

STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY

CH-47B U.S.A. S/N 66-19100

AUTOROTATION

SYM.	AVG. GROSS WEIGHT LB.	AVG. DENSITY ALTITUDE FT.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
O	40000	5000	329.6(MID)	230

NOTES:

1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

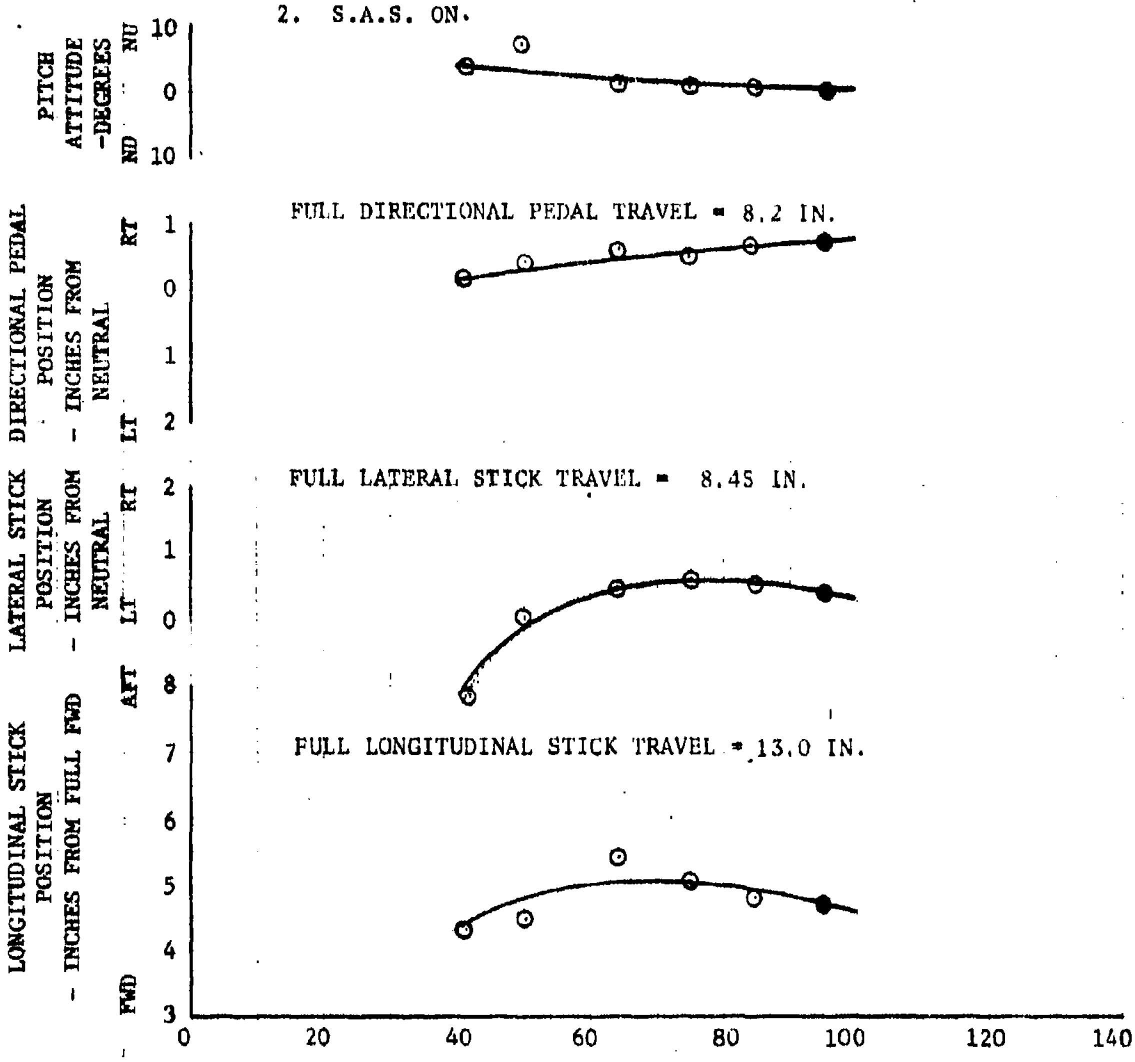


FIGURE NO. 158
STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY
CH-47B U.S.A. S/N 66-19100
AUTOROTATION

SYM.	AVG. GROSS WEIGHT LB	AVG. DENSITY ALTITUDE FT	AVG. C.G. IN	AVG. ROTOR SPEED R.P.M.
O	33000	5000	330.8 (MID)	230

NOTES:
1. DCP SPEED TRIM, FWD & AFT CYCLIC SPEED TRIM ON AUTOMATIC SCHEDULE.
2. S.A.S. ON.

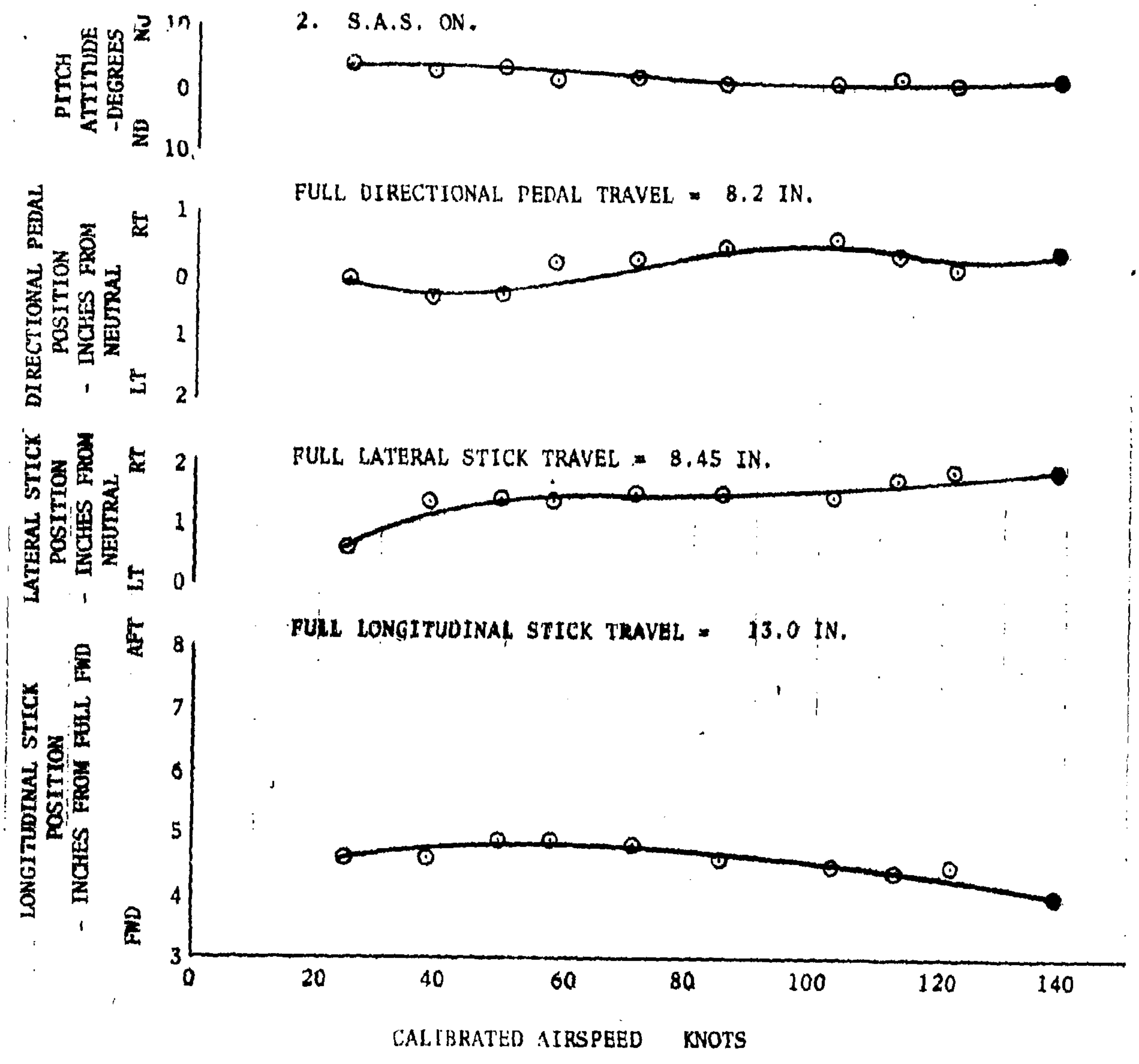


FIGURE NO. 159
STATIC LATERAL-DIRECTIONAL STABILITY
CH-47B U.S.A. S/N 66-19100
AUTOROTATION

TRIM AIRSPEED = 57.8 KCAS
AVG. GROSS WT = 26404 LBS
AVG. DENSITY ALT = 2446 FEET
AVG. ROTOR SPEED = 225 RPM
S.A.S. CONFIG = ON
AVG. C.G. = 331.4 (MID)

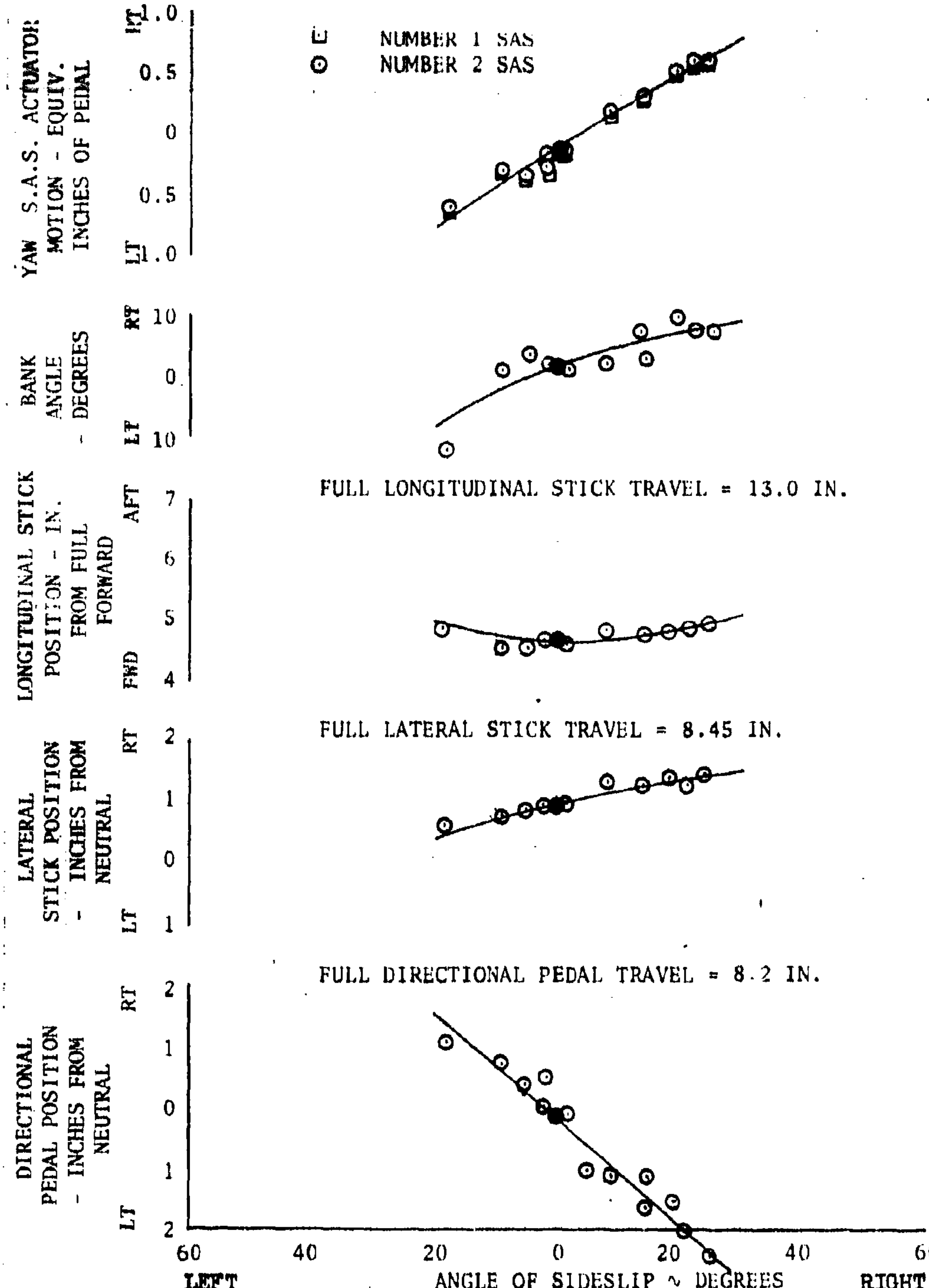


FIGURE NO. 160

STATIC LATERAL-DIRECTIONAL STABILITY

CH-47B U.S.A. S/N 66-19100

CLIMB

TRIM AIRSPEED = 57.8 KCAS	AVG. ROTOR SPEED = 225 RPM
AVG. GROSS WT = 26404 LBS.	S.A.S. CONFIG = ON
AVG. DENSITY ALT = 2446 FEET	AVG. C.G. = 331.4 (MID)

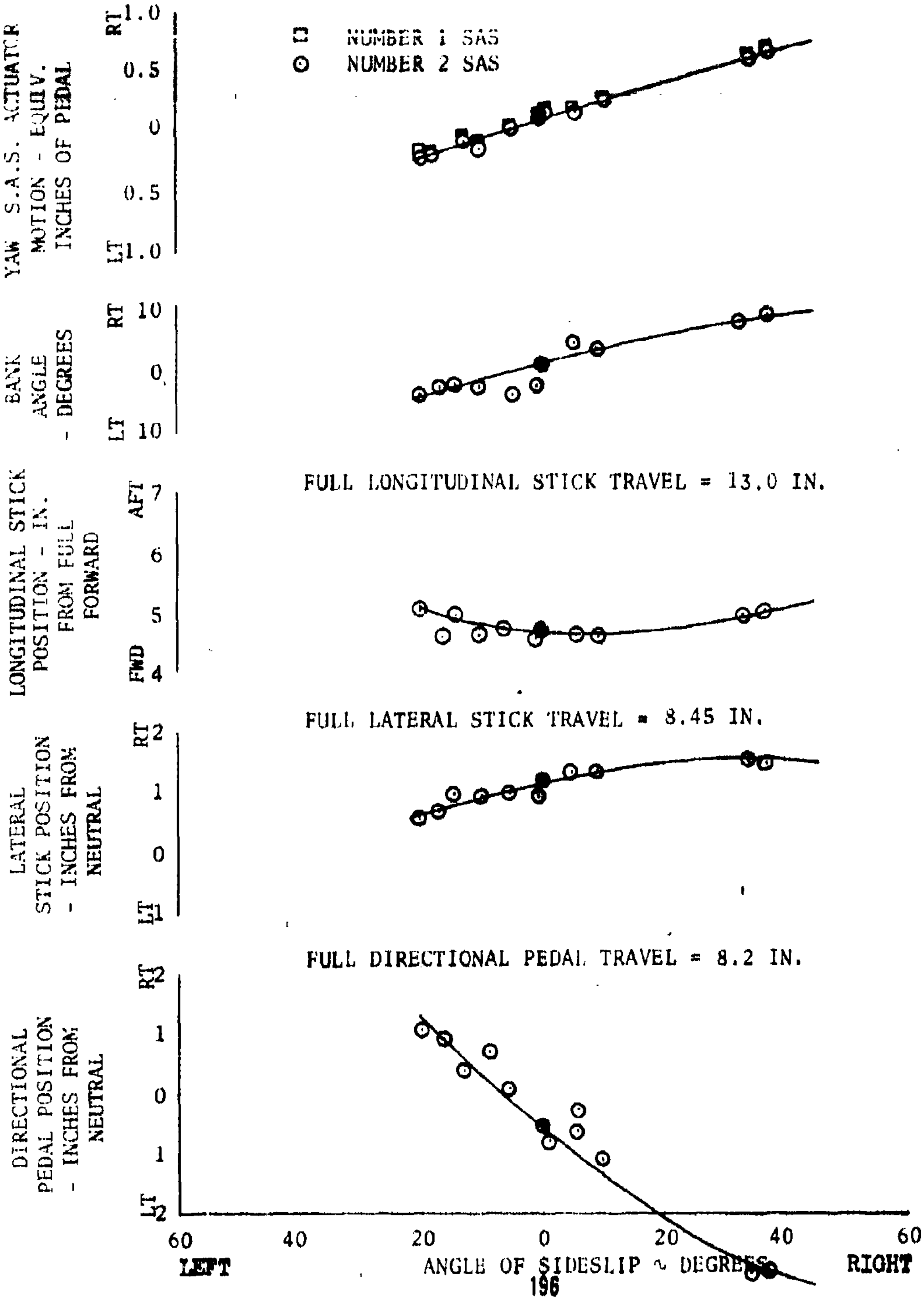


FIGURE NO. [illegible]

STATIC LATERAL-DIRECTIONAL STABILITY

CH-47B [illegible] 19190

LEVEL FLIGHT

TRIM AIRSPEED = [illegible] AVG. ROTOR SPEED = 225 RPM

AVG. GROSS WT = 28230 LBS. S.A.S. CONFIG = ON

AVG. DENSITY ALT = [illegible] FEET AVG. C.G. = 330.4 (MID)

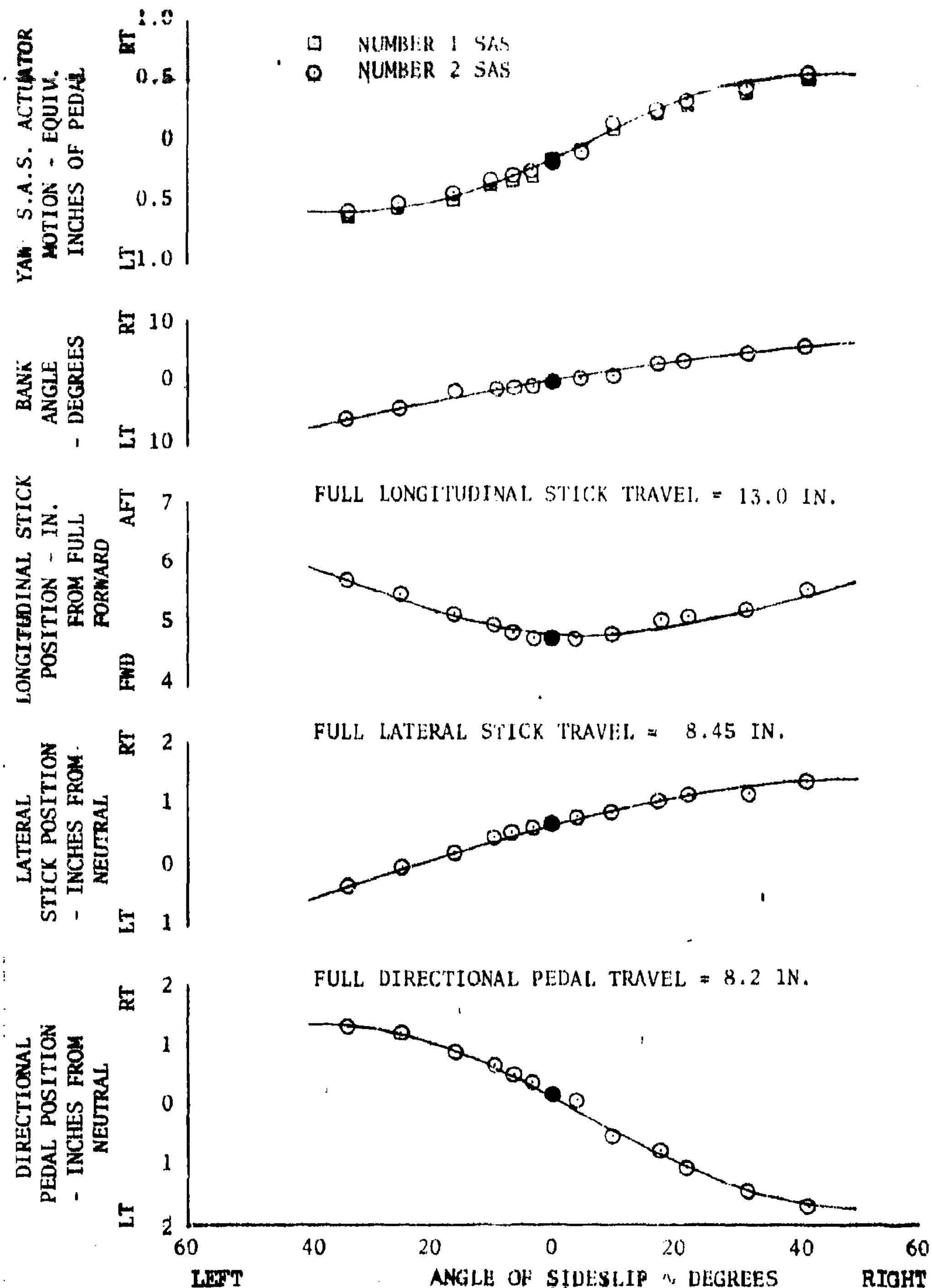


FIGURE NO. 92

STATIC LATERAL DIRECTIONAL STABILITY

CH-47B U.S.A. S/N 66-19100

LEVEL FLIGHT

TRIM AIRSPEED = 100.9 KCAS	AVG. ROTOR SPEED = 230 RPM
AVG. GROSS WT = 27967 LBS.	S.A.S. CONFIG = ON
AVG. DENSITY ALT = 3354 FEET	AVG. C.G. = 330.5 (MID)

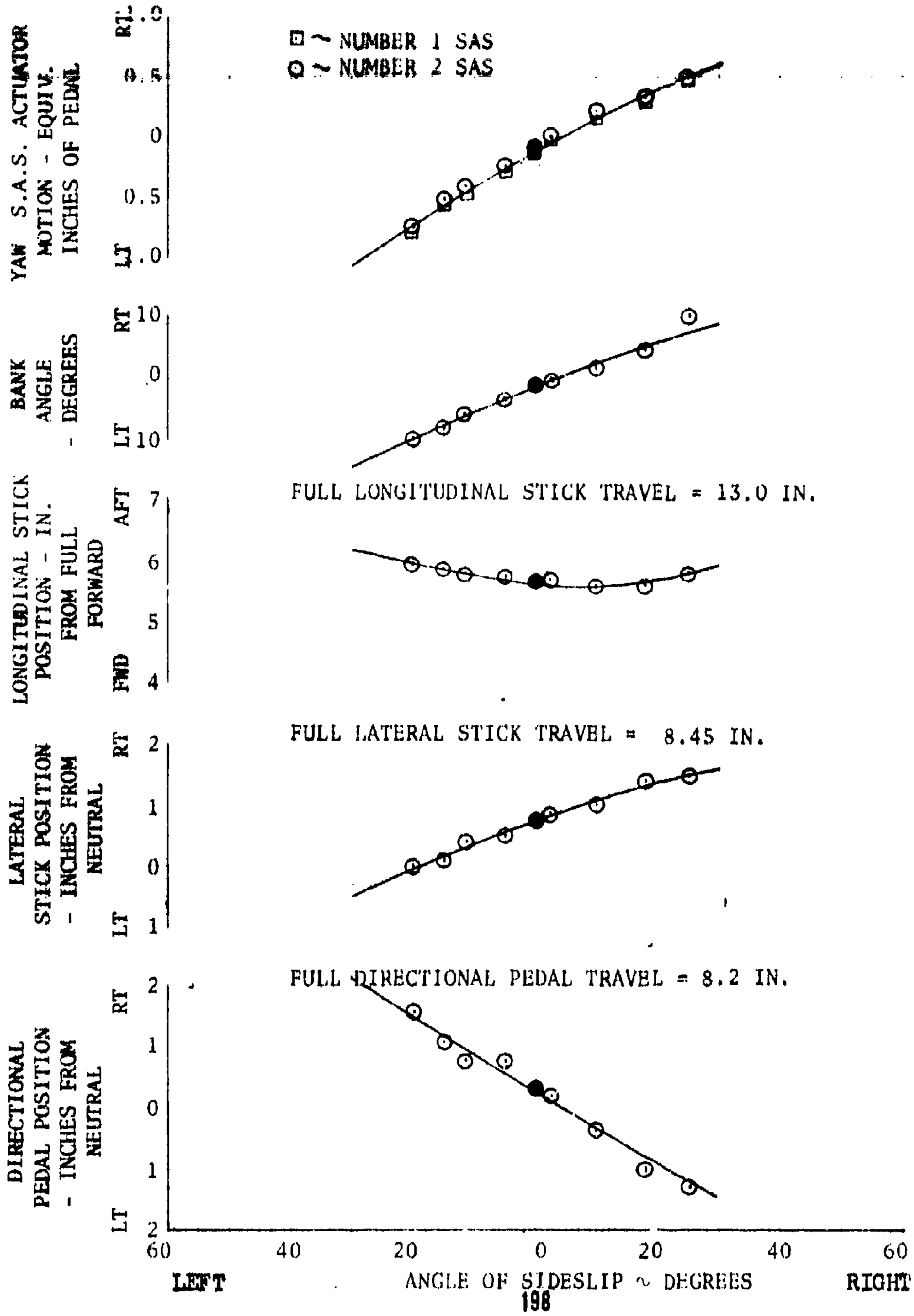


FIGURE NO. 163
STATIC LATERAL DIRECTIONAL STABILITY
CH-47B U.S.A. S/N 66-19120
CLIMB

TRIM AIRSPEED = 100.8 KCAS
AVG. GROSS WT = 28041 LBS.
AVG. DENSITY ALT = 5482 FEET

AVG. ROTOR SPEED = 225 RPM
S.A.S. CONFIG. - ON
AVG. C.G. - 330.61 (MID)

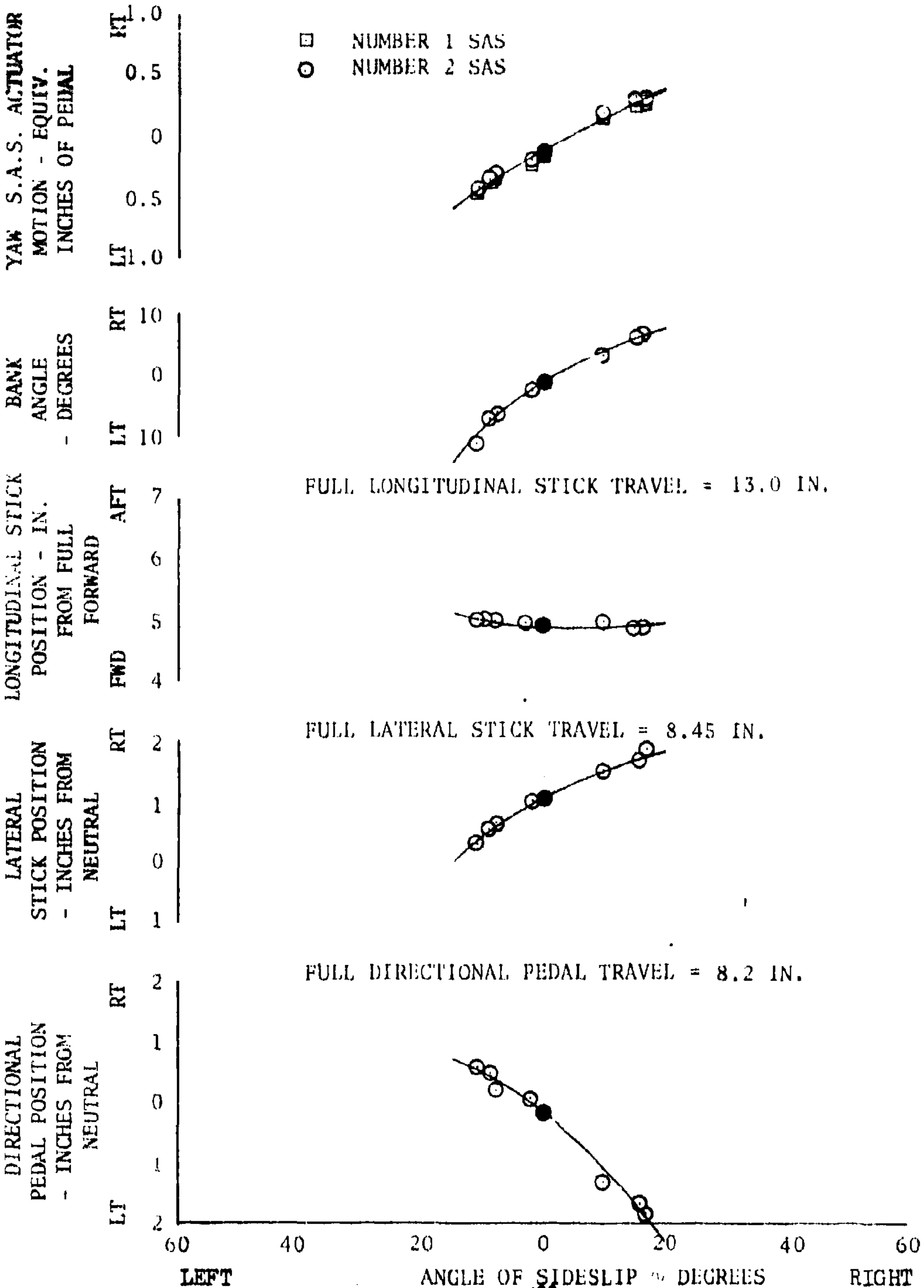


FIGURE NO. 164
STATIC LATERAL-DIRECTIONAL STABILITY
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

TRIM AIRSPEED = 57.8 KCAS
AVG. GROSS WT = 38121
AVG. DENSITY ALT = 5606 FEET

AVG. ROTOR SPEED = 230 RPM
S.A.S. CONFIG = ON
AVG. C.G. = 330.62 (MID)

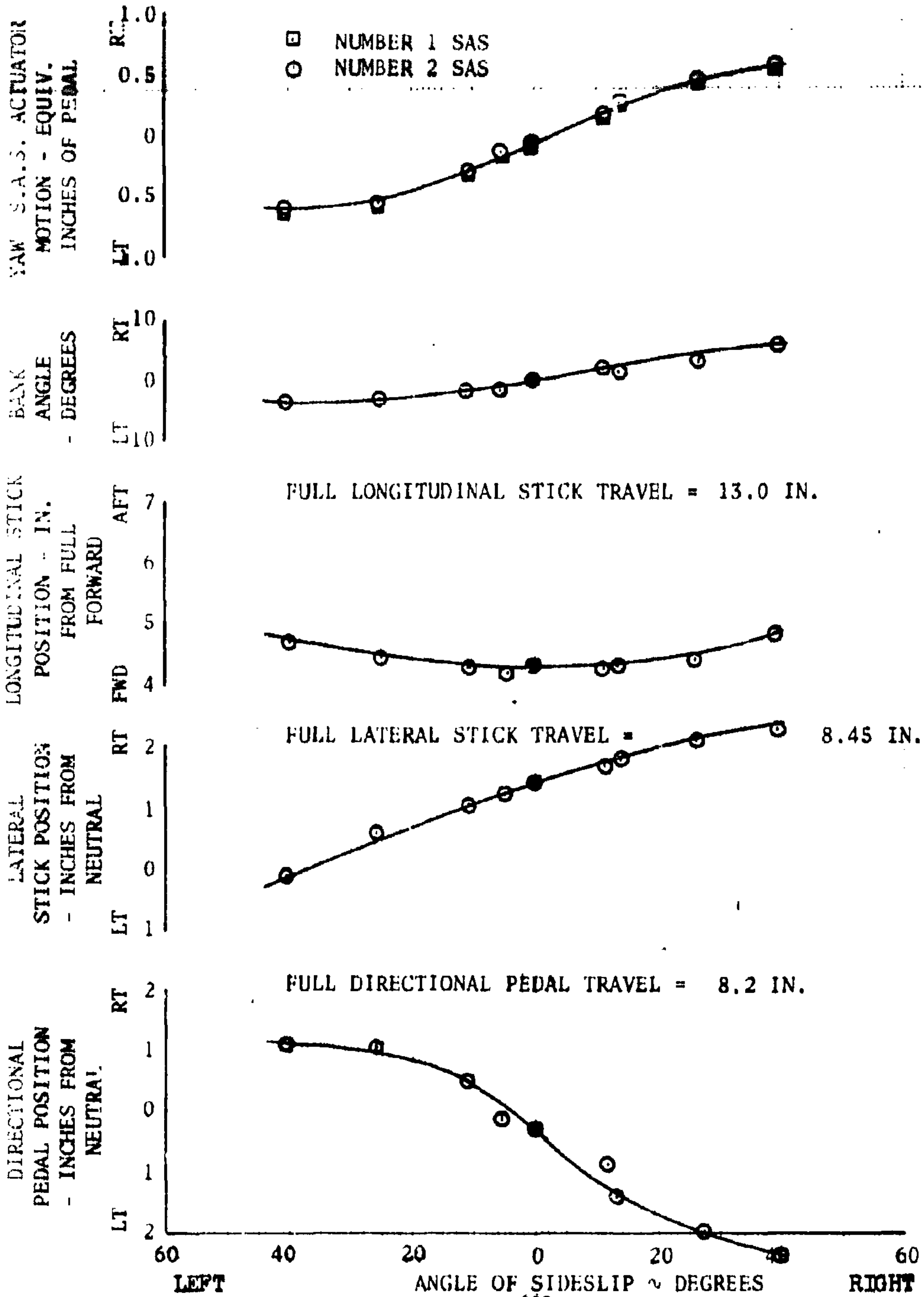


FIGURE NO. 165
STATIC LATERAL DIRECTIONAL STABILITY
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

TRIM AIRSPEED = 60.0KCAS
AVG. GROSS WT = 37919 LBS.
AVG. DENSITY ALT = 4893 FEET
AVG. ROTOR SPEED = 230 RPM
S.A.S. CONFIG = ON
AVG. C.G. = 313.69 (FWD)

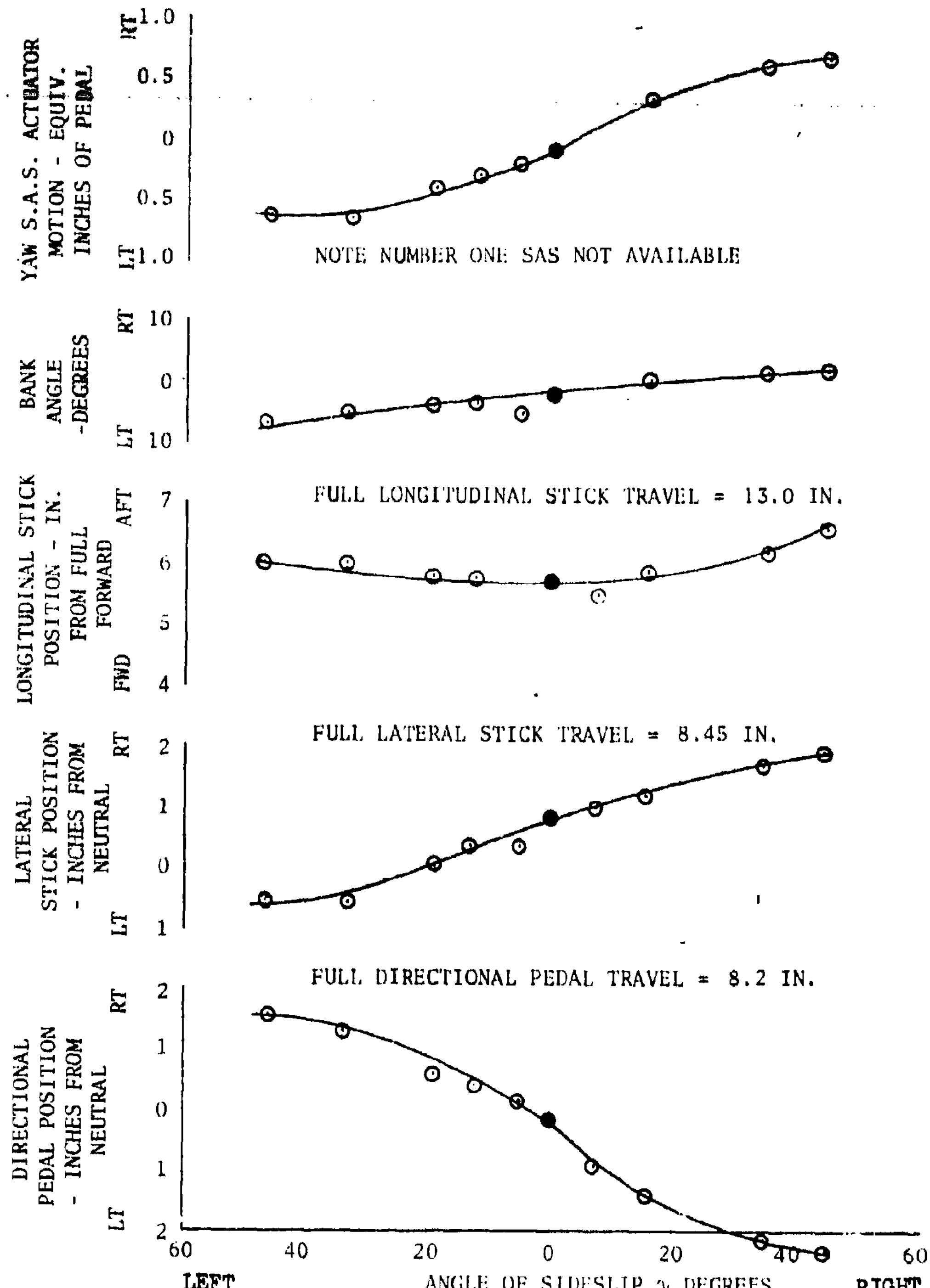


FIGURE NO. 166
STATIC LATERAL-DIRECTIONAL STABILITY
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

TRIM AIRSPEED = 57.8 KCAS
AVG. GROSS WT = 36675 LBS.
AVG. DENSITY ALT = 4321 FEET

AVG. ROTOR SPEED = 230 RPM
S.A.S. CONFIG = ON
AVG. C.G. = 335.57 (AFT)

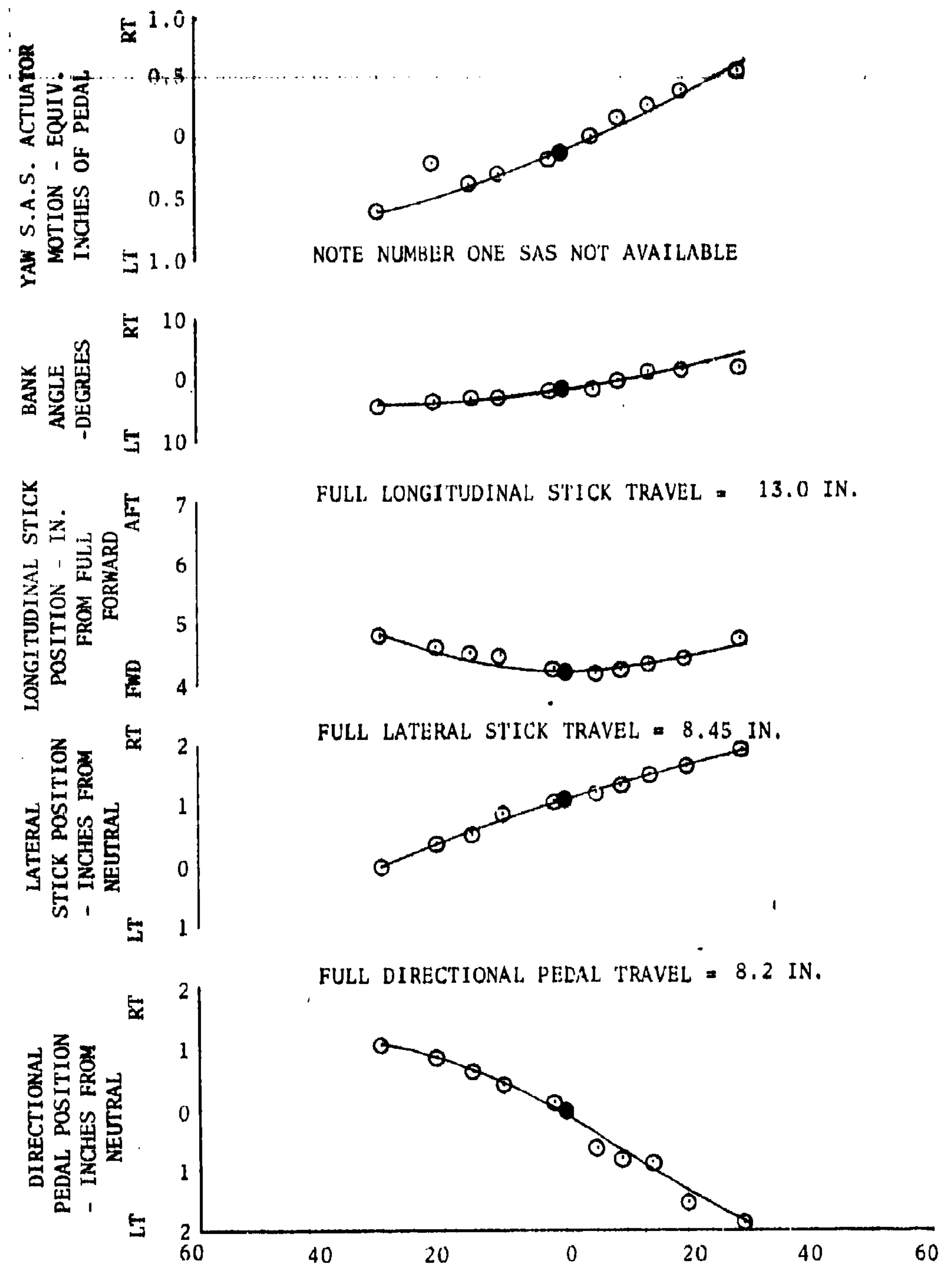


FIGURE NO. 167
STATIC LATERAL-DIRECTIONAL STABILITY
CH-47B U.S.A. S/N 66-19100
CLIMB

TRIM AIRSPEED = 81.5 KCAS
AVG. GROSS WT = 36440 LBS
AVG. DENSITY ALT = 5510 FT.

AVG. ROTOR SPEED = 230 RPM
S.A.S. CONFIG = ON
AVG. C.G. = 313.5 (FWD)

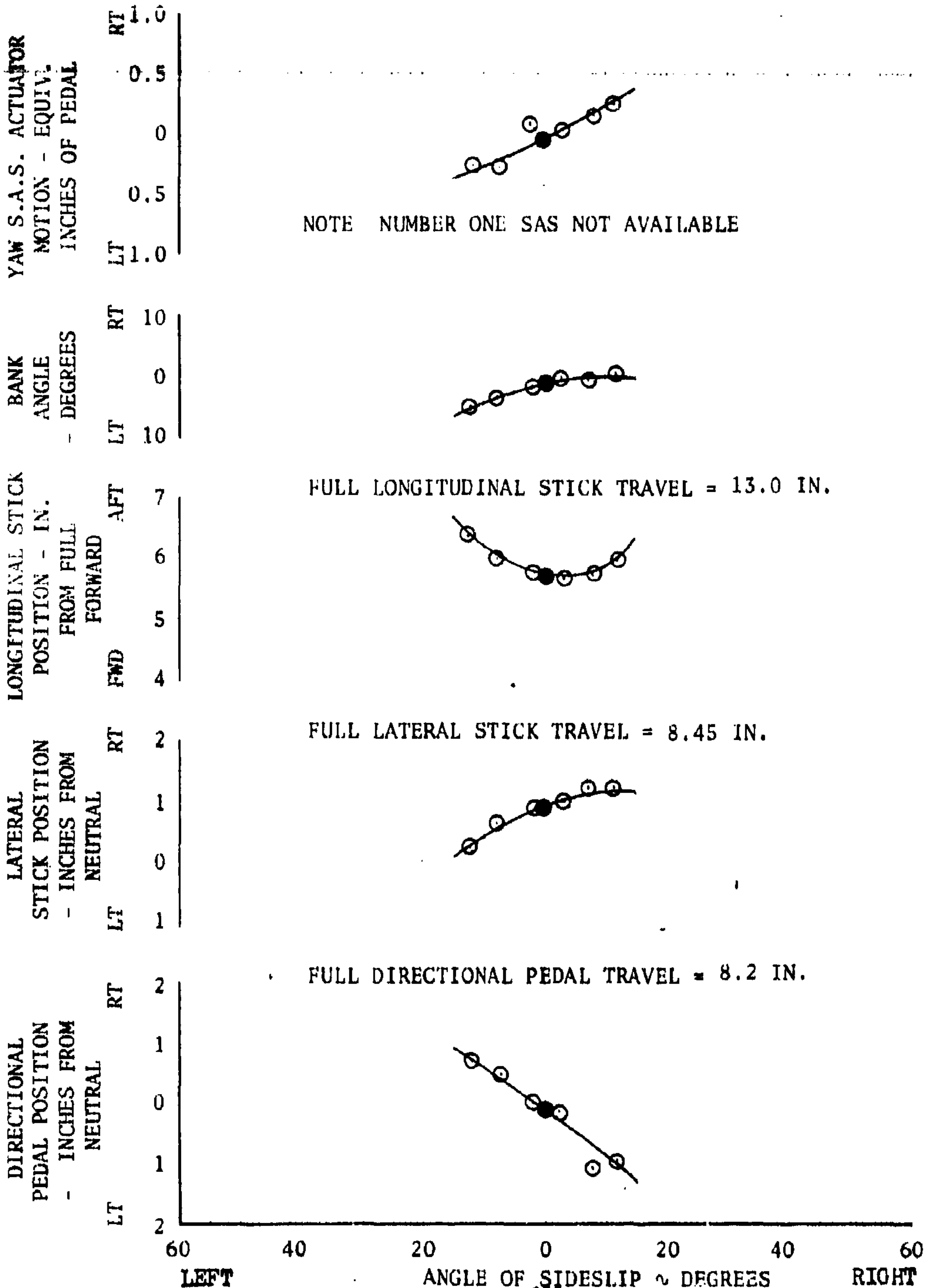


FIGURE NO. 168

STATIC LATERAL-DIRECTIONAL STABILITY

CH-47B U.S.A. S/N 66-19100

LEVEL FLIGHT

TRIM AIRSPEED = 100.8 KCAS   AVG. ROTOR SPEED = 230 RPM

AVG. GROSS WT = 37422 LBS.   S.A.S. CONFIG = ON

AVG. DENSITY ALT = 5109 FEET   AVG. C.G. = 330.87 (MID)

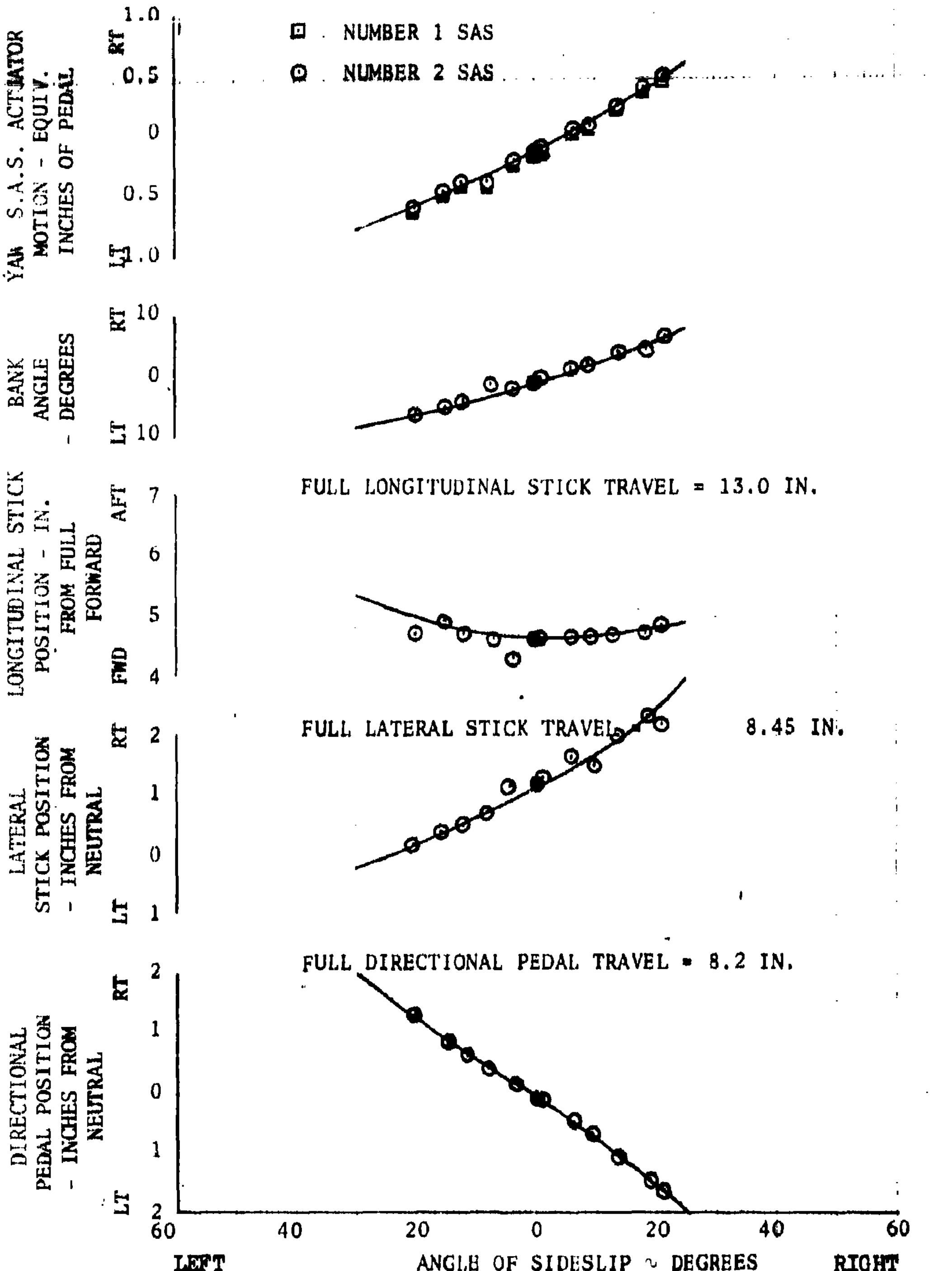


FIGURE NO. 169

STATIC LATERAL-DIRECTIONAL STABILITY

CH-47B U.S.A. S/N 66-19100

LEVEL FLIGHT

TRIM AIRSPEED = 116.9 KCAS — AVG. ROTOR SPEED = 230RPM

AVG. GROSS WT = 36870 LBS. — S.A.S. CONFIG = ON

AVG. DENSITY ALT = 5842 FEET — AVG. C.G. = 331.07 (MID)

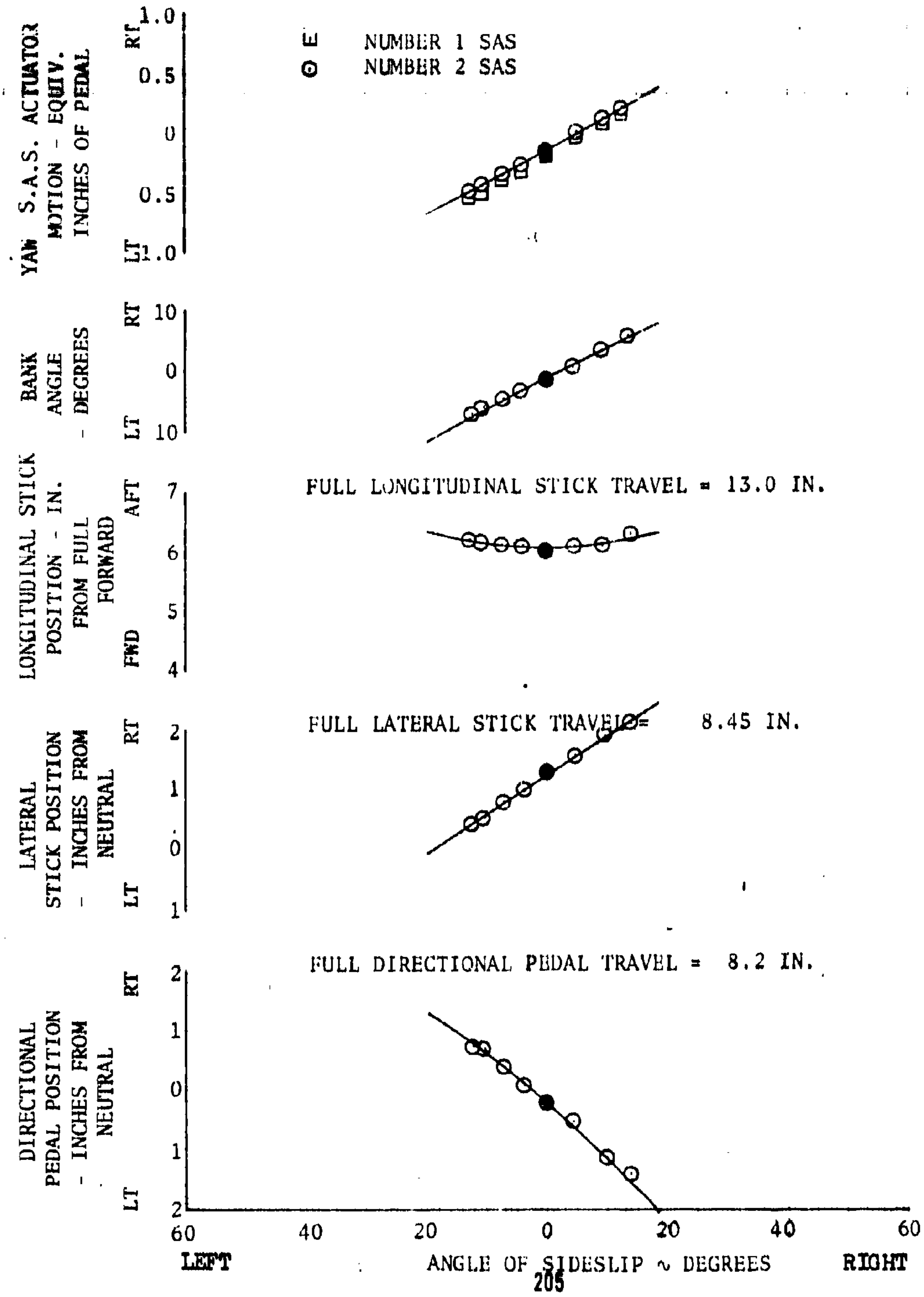


FIGURE NO. 170

STATIC LATERAL-DIRECTIONAL STABILITY

CH-47B U.S.A. S/N 66-19100

LEVEL FLIGHT

TRIM AIRSPEED = 122.3 KCAS
AVG. GROSS WT = 37036 LBS.
AVG. DENSITY ALT = 5935 FEET

AVG. ROTOR SPEED = 230 RPM
S.A.S. CONFIG = ON
AVG. C.G. = 330.99 (MID)

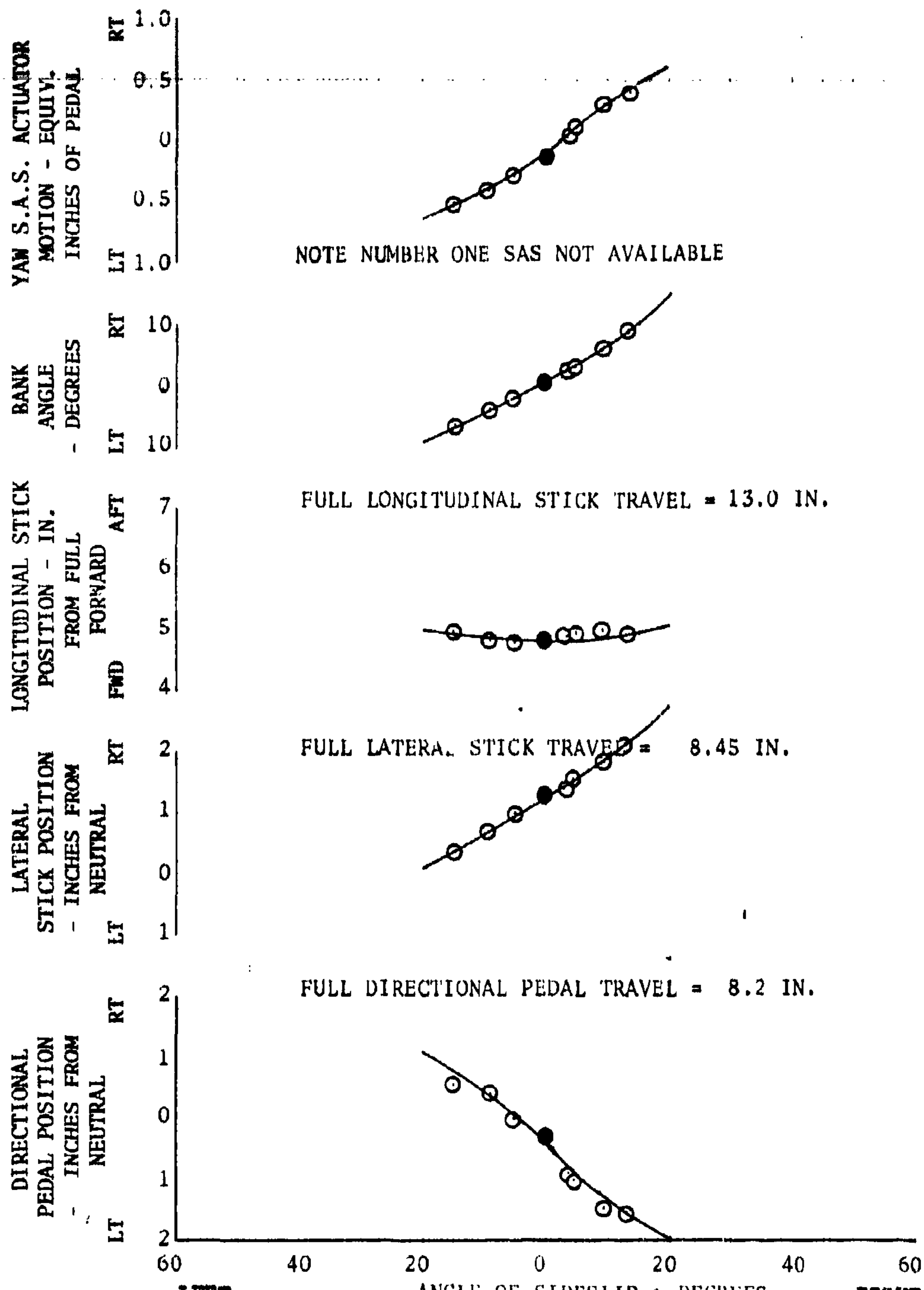


FIGURE NO. 171
STATIC LATERAL-DIRECTIONAL STABILITY
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

TRIM AIRSPEED = 60 KCAS
AVG. GROSS WT = 28044 LBS.
AVG. DENSITY ALT = 10,241 FEET

AVG. ROTOR SPEED = 230 RPM
S.A.S. CONFIG = ON
AVG. C.G. = 330.55 (MID)

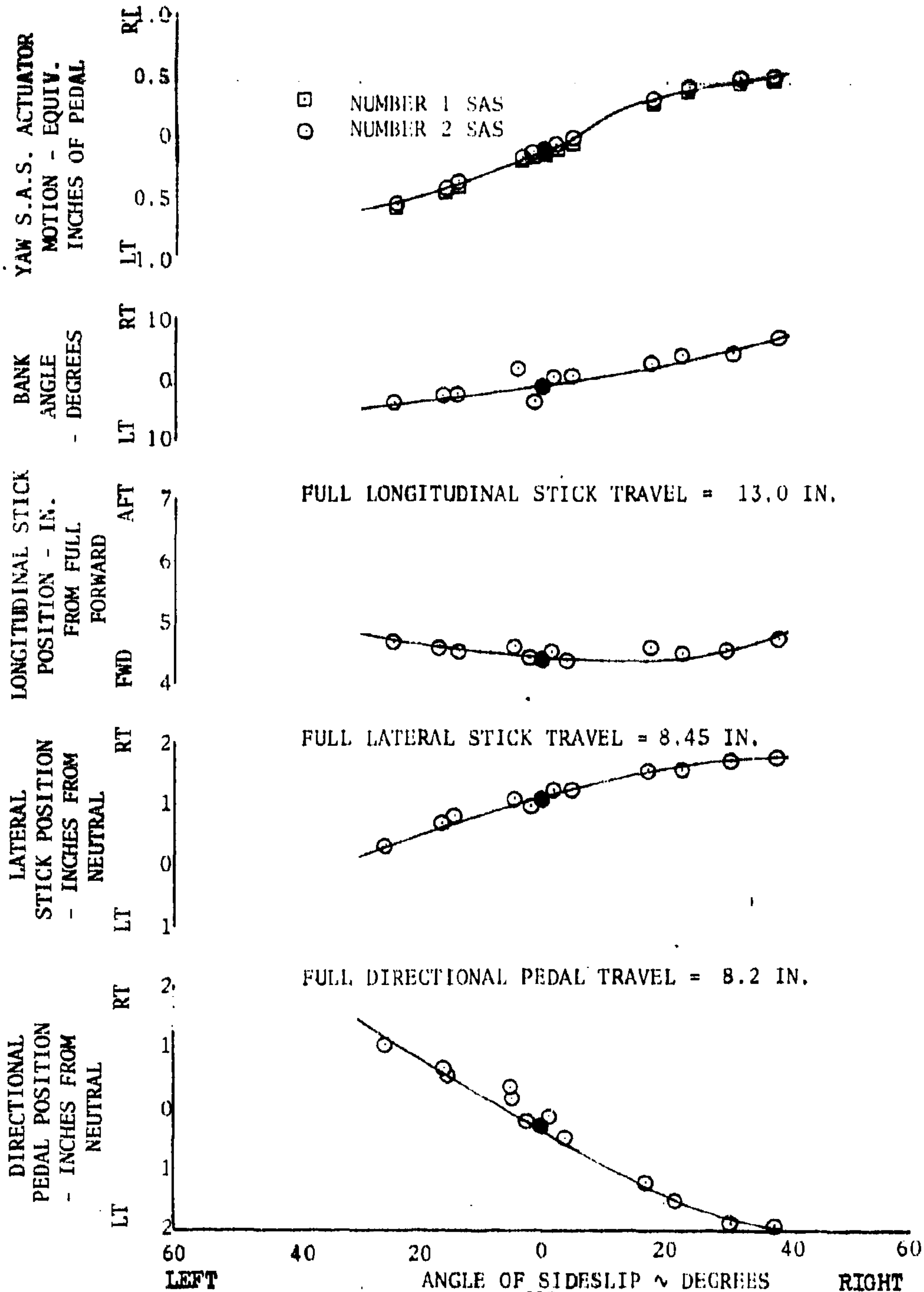


FIGURE NO. 172
STATIC LATERAL-DIRECTIONAL STABILITY
CH-47B U.S.A. S/N 66-19100
CLIMB

TRIM AIRSPEED = 81.5 KCAS
AVG. GROSS WT = 27782 LBS.
AVG. DENSITY ALT = 9073 FEET

AVG. ROTOR SPEED = 230 RPM
S.A.S. CONFIG = ON
AVG. C.G. = 330.60 (MID)

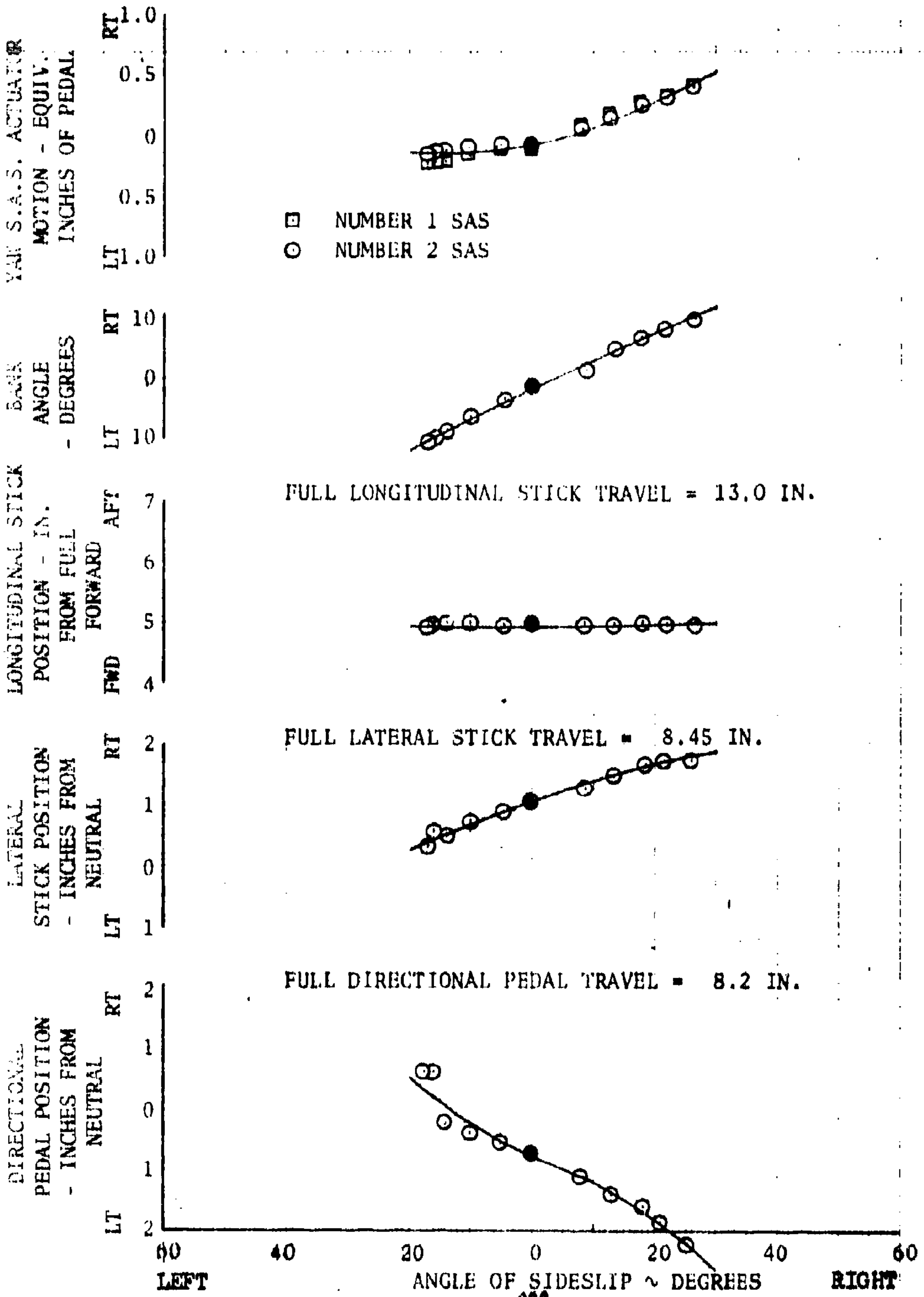


FIGURE NO. 173
STATIC LATERAL-DIRECTIONAL STABILITY
CH-47B U.S.A. S/N 66-19100
AUTOROTATION

TRIM AIRSPEED = 81.5 KCAS AVG. ROTOR SPEED = 230 RPM
AVG. GROSS WT = 27782 LBS. S.A.S. CONFIG = ON
AVG. DENSITY ALT = 9073 FEET AVG. C.G. = 330.60 (MID)

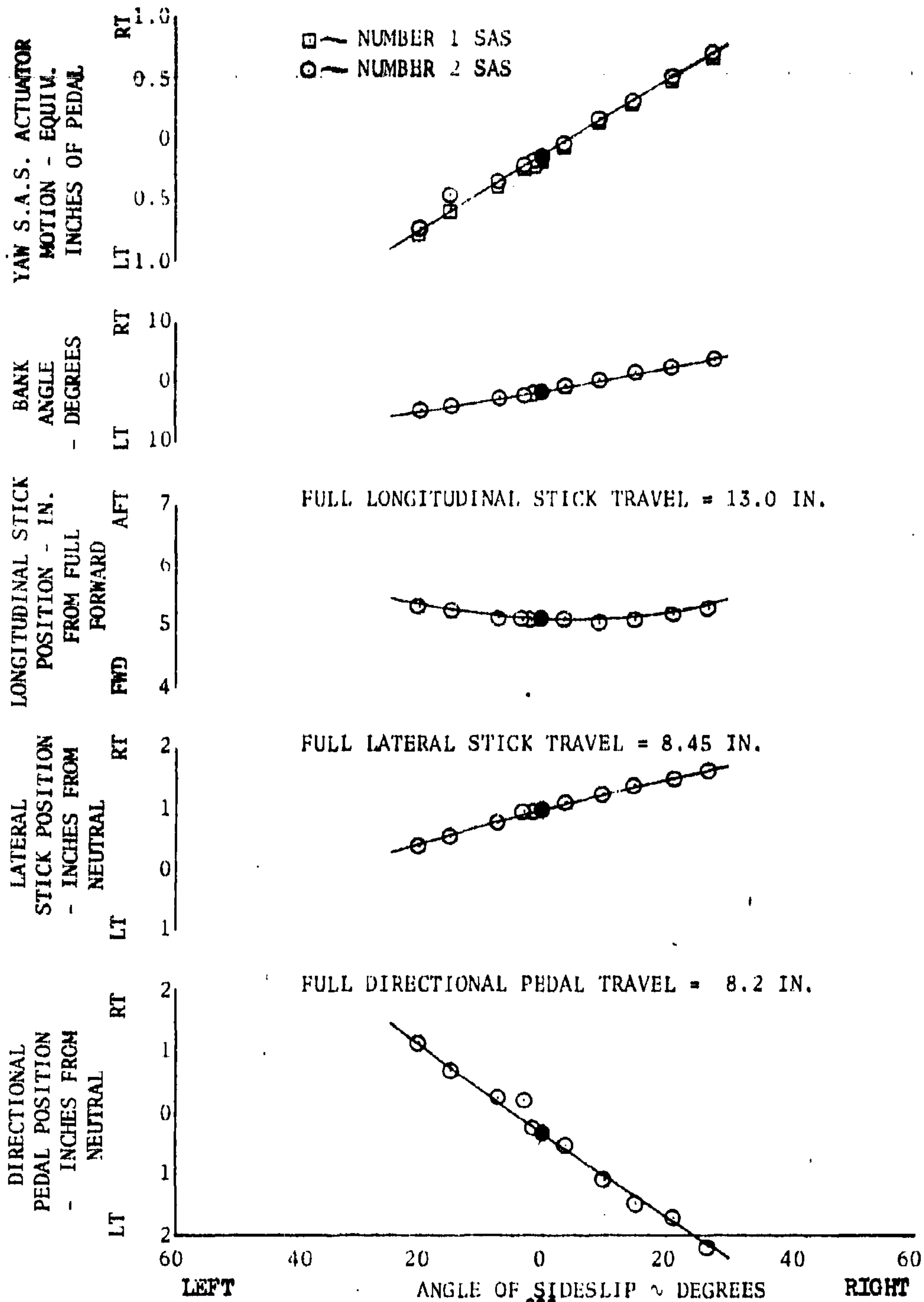


FIGURE NO. 174
STATIC LATERAL-DIRECTIONAL STABILITY
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

TRIM AIRSPEED = 90.1 KCAS
AVG. GROSS WT = 27736 LBS.
AVG. DENSITY ALT =9565 FEET
AVG. ROTOR SPEED = 230 RPM
S.A.S. CONFIG = ON
AVG. C.G. = 330.70 (MID)

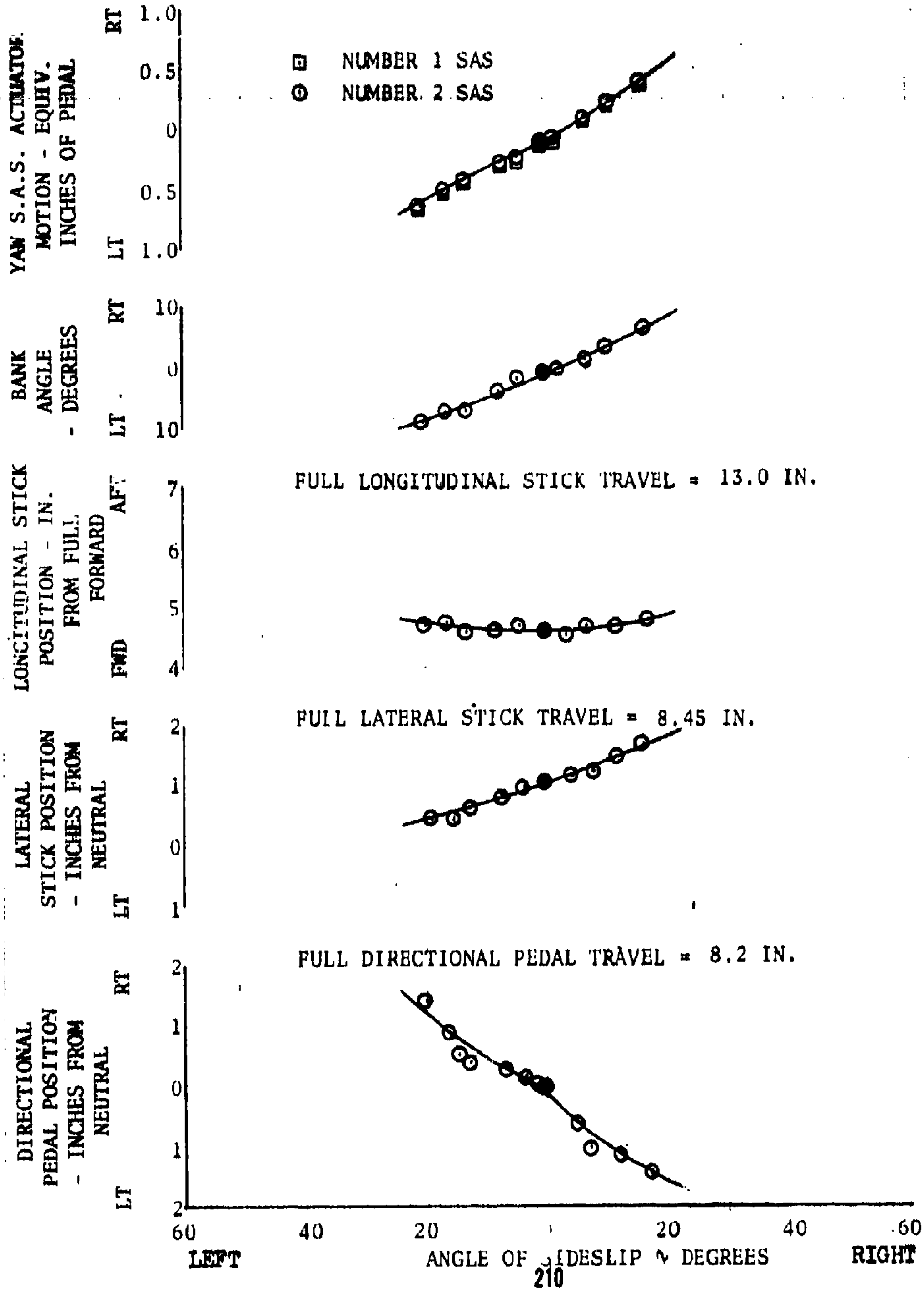


FIGURE NO. 175
STATIC LATERAL-DIRECTIONAL STABILITY
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

TRIM AIRSPEED = 115 KCAS
AVG. GROSS WT = 27610 LBS.
AVG. DENSITY ALT = 10717 FEET
AVG. ROTOR SPEED = 230 RPM
S.A.S. CONFIG = ON
AVG. C.G. = 330.76 (MID)

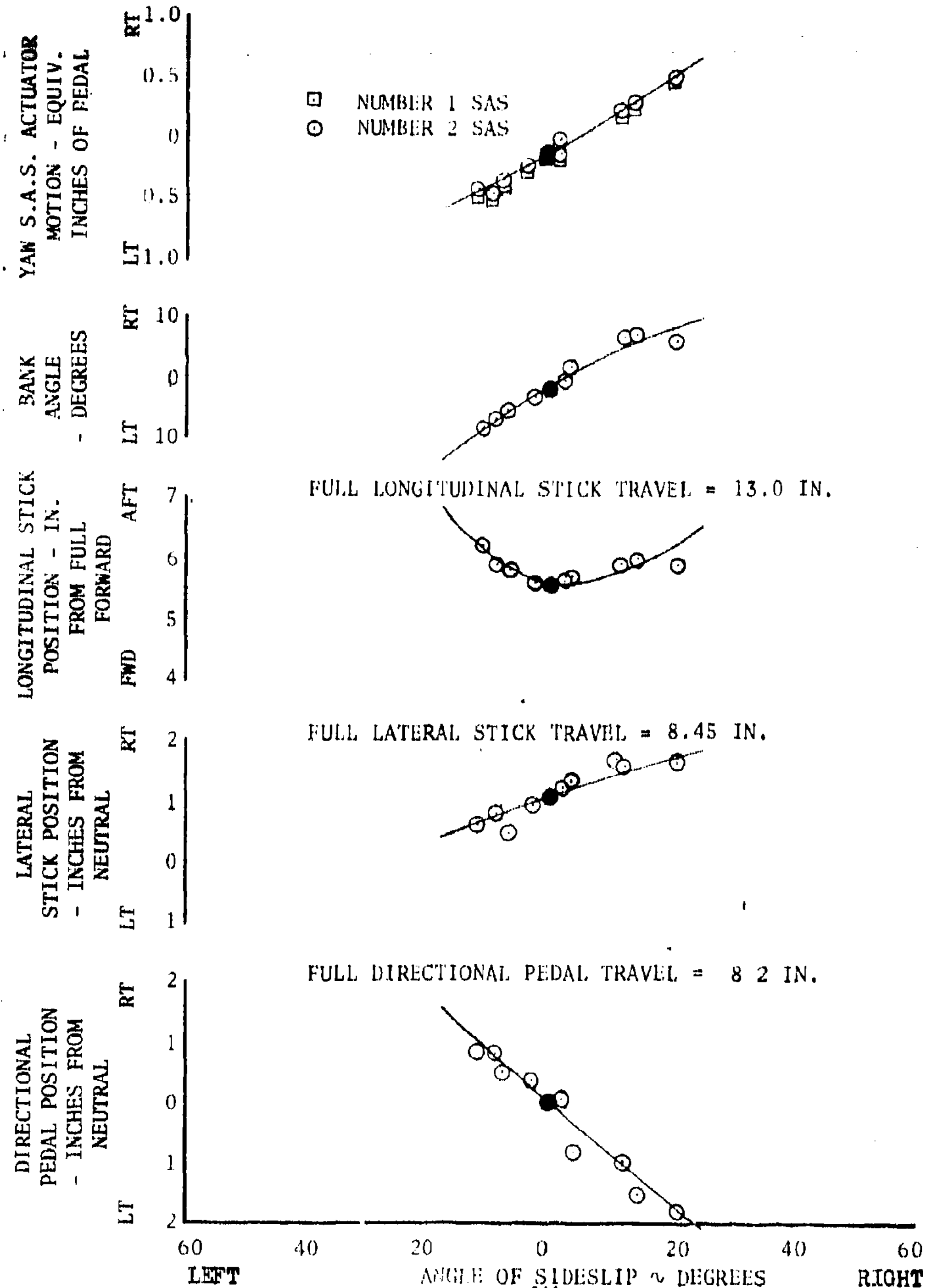
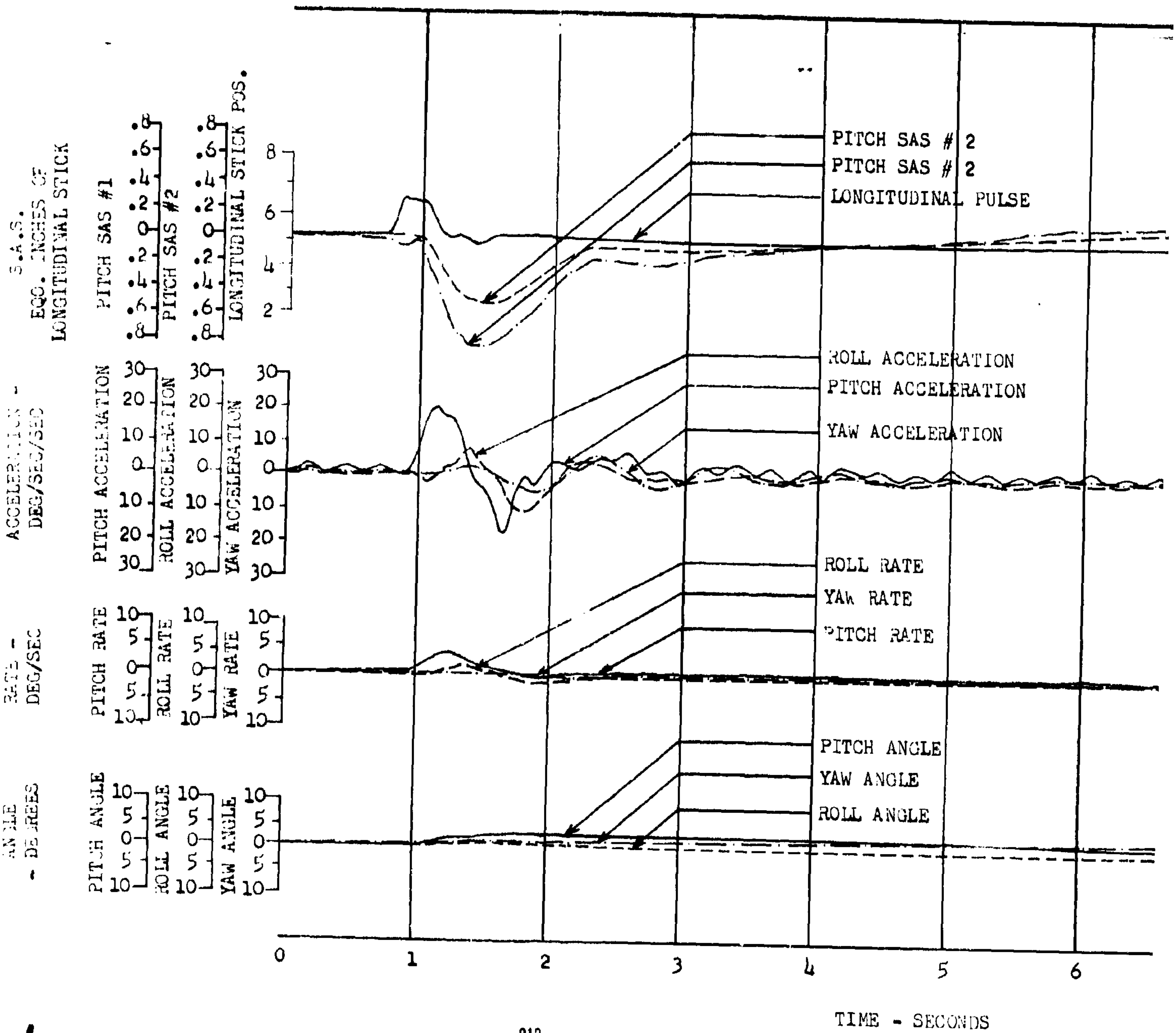


FIGURE NO. 1?
TIME HISTORY OF DYNAMIC STABILITY
CH-47B U.S.A. S/N 66-19100
LONGITUDINAL STICK, 1 INCH AFT. PULSE

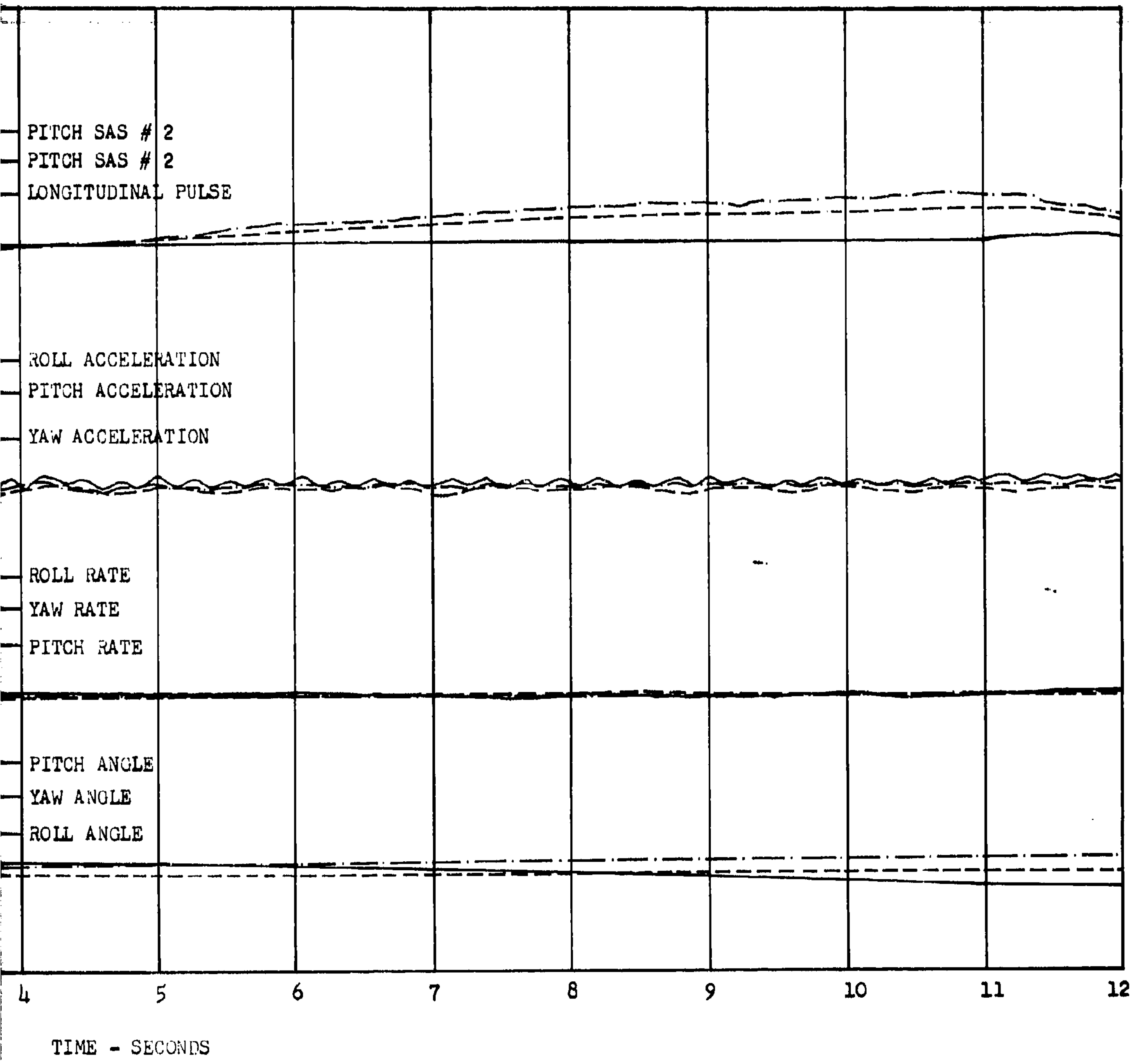
TRIM AIRSPEED = 90 KCAS
AVERAGE GROSS WEIGHT = 38470 LBS.
AVERAGE C.G. = 331.0 (MID)

AVERAGE DENSITY ALTI
AVERAGE ROTOR SPEED
S.A.S. CONDITION = (



1

FIGURE NO. 17[illegible]
Y OF DYNAMIC STABILITY
U.S.A. S/N 66-19100
STICK, 1 INCH AFT. PULSE
AVERAGE DENSITY ALTITUDE = 3400 FEET
) LBS. AVERAGE ROTOR SPEED = 230 RPM
S.A.S. CONDITION = ON

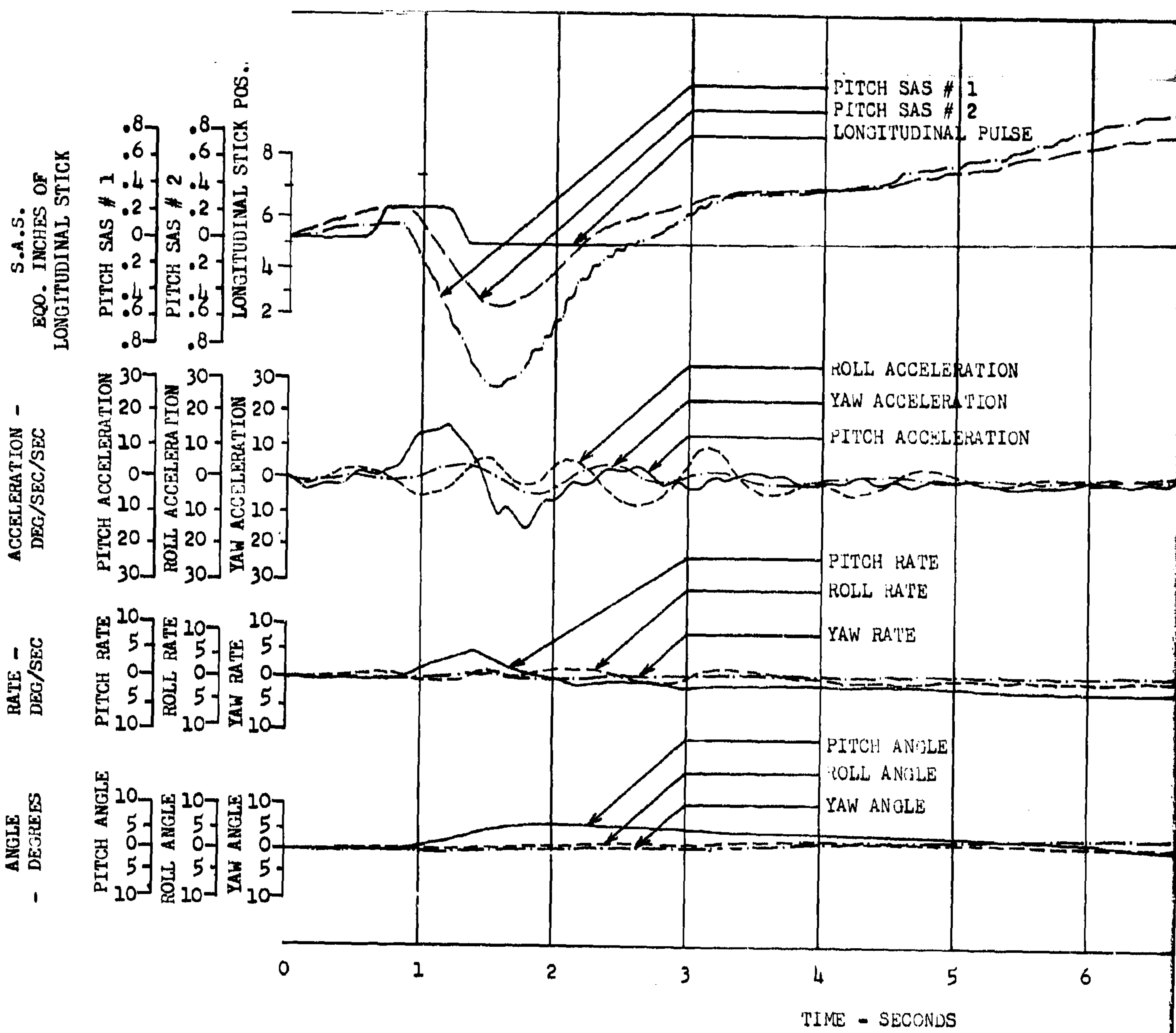


2

TIME HISTORY OF DYNAMIC STABILITY
CH-47 B U.S.A. S/N 66-19100
LONGITUDINAL STICK, 1 INCH AFT. PULSE

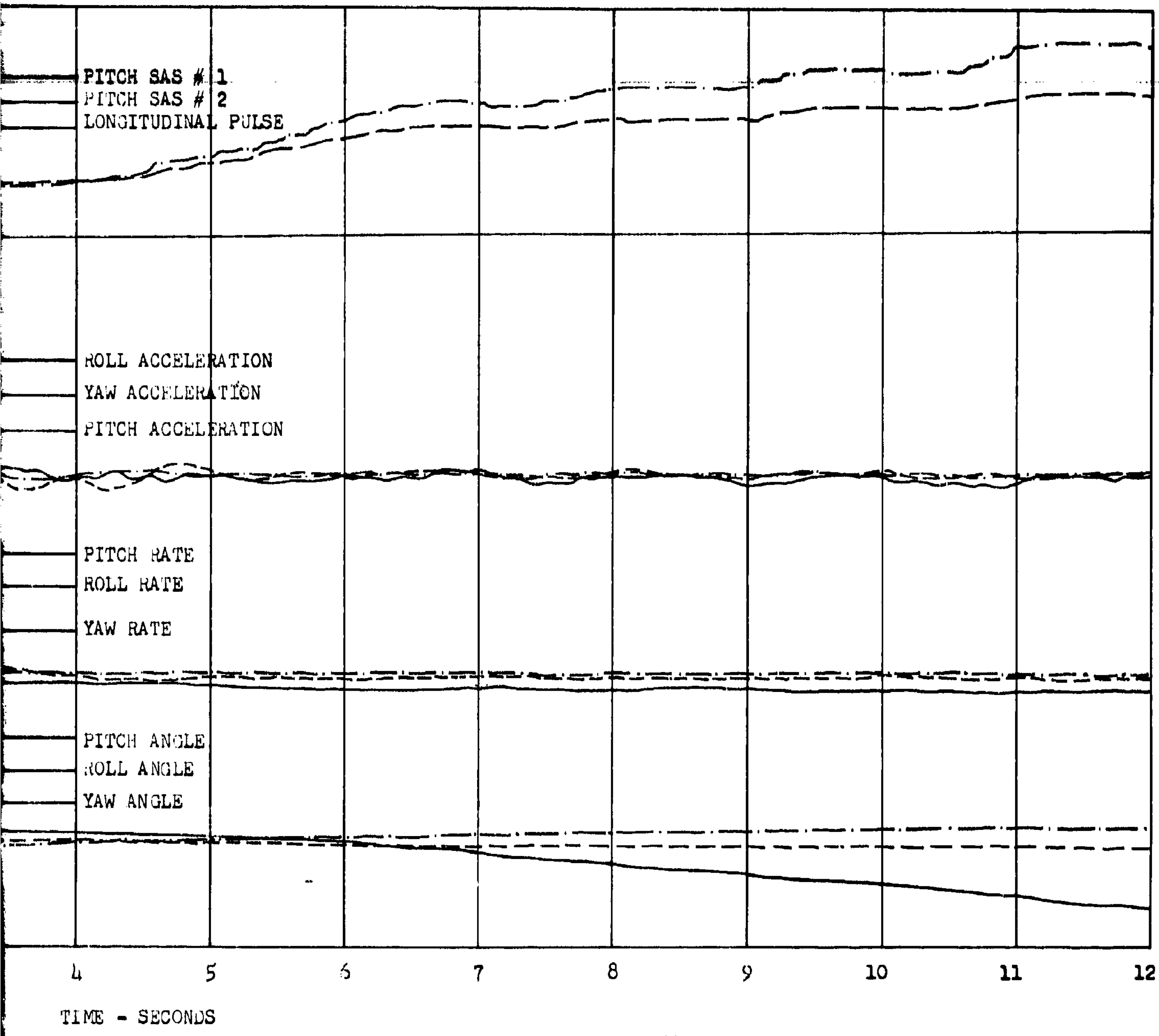
TRIM AIRSPEED = 70 KCAS
AVERAGE GROSS WEIGHT = 38470 LBS.
AVERAGE C.G. = 331.0 (MID)

AVERAGE DENSITY ALT
AVERAGE ROTOR SPEED
S.A.S. CONDITION =O



1

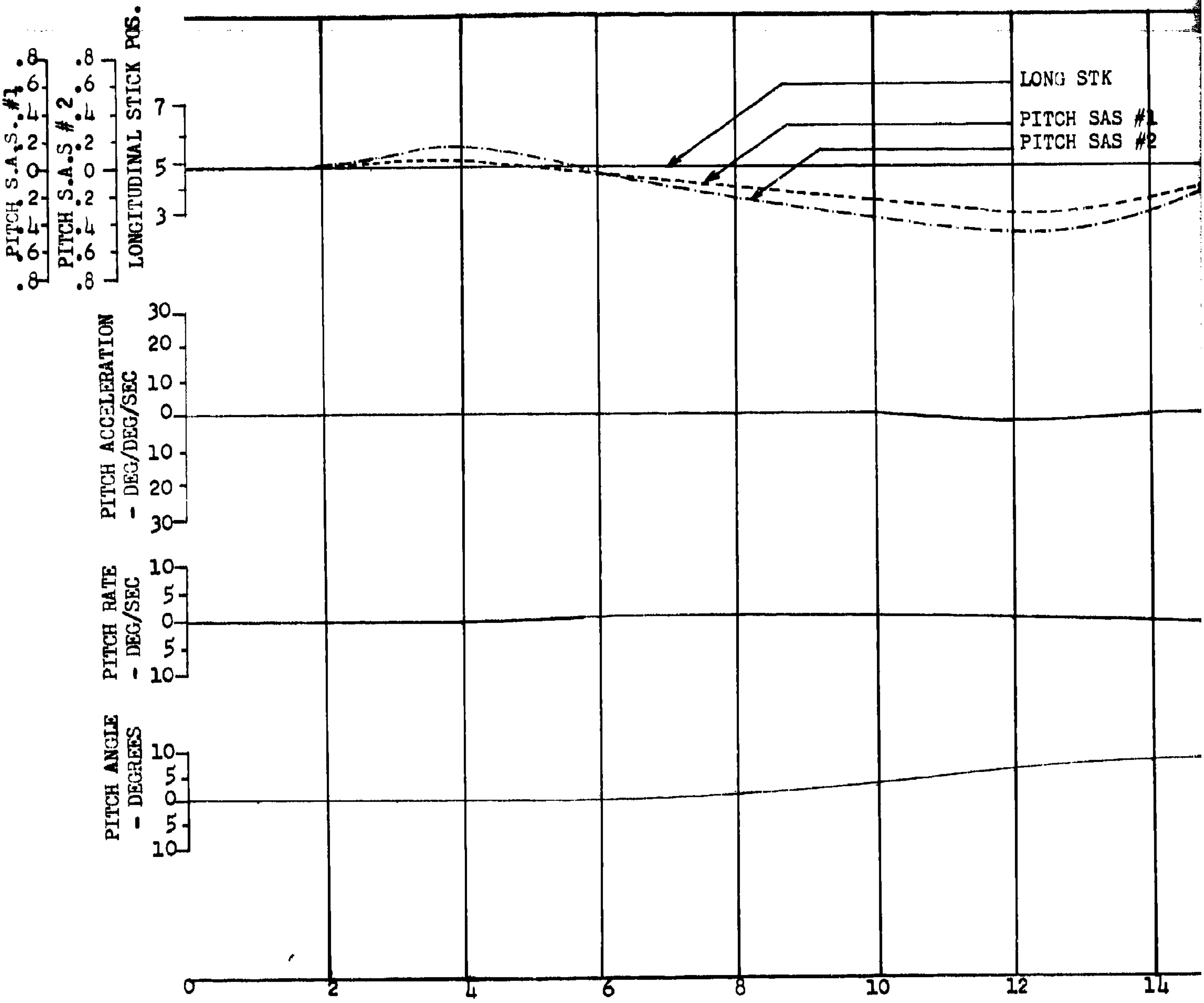
IISTORY OF DYNAMIC STABILITY
B U.S.A. S/N 66-19100
DINAL STICK, 1 INCH AFT. PULSE
AVERAGE DENSITY ALTITUDE = 3220 FEET
38470 LBS. AVERAGE ROTOR SPEED = 230 RPM
MID) S.A.S. CONDITION =ON



2

FIGURE NO.
TIME HISTORY OF DYNAMIC ST
CH-47B USA S/N 66-
LONGITUDINAL STICK

TRIM AIRSPEED = 70 KCAS
AVERAGE GROSS WEIGHT = 37500 LB
AVERAGE C.G. = 335.0 (AFT)

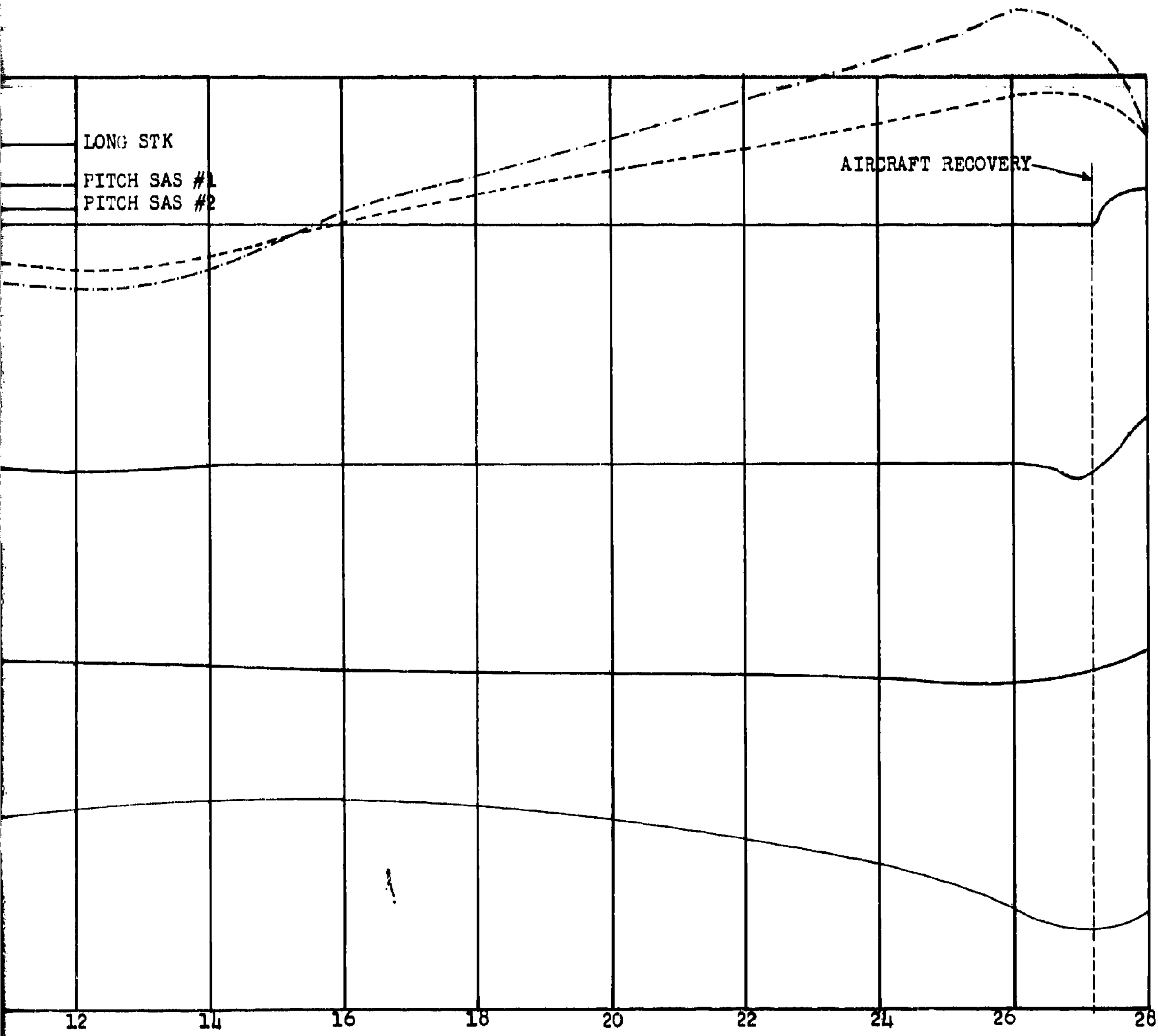


1

FIGURE NO. 178
E HISTORY OF DYNAMIC STABILITY
-47B USA S/N 66-19100
LONGITUDINAL STICK FIXED

S
37500 LB
AFT)

AVERAGE DENSITY ALTITUDE = 3870 FEET
AVERAGE ROTOR SPEED = 230 RPM
S.A.S. CONDITION = ON

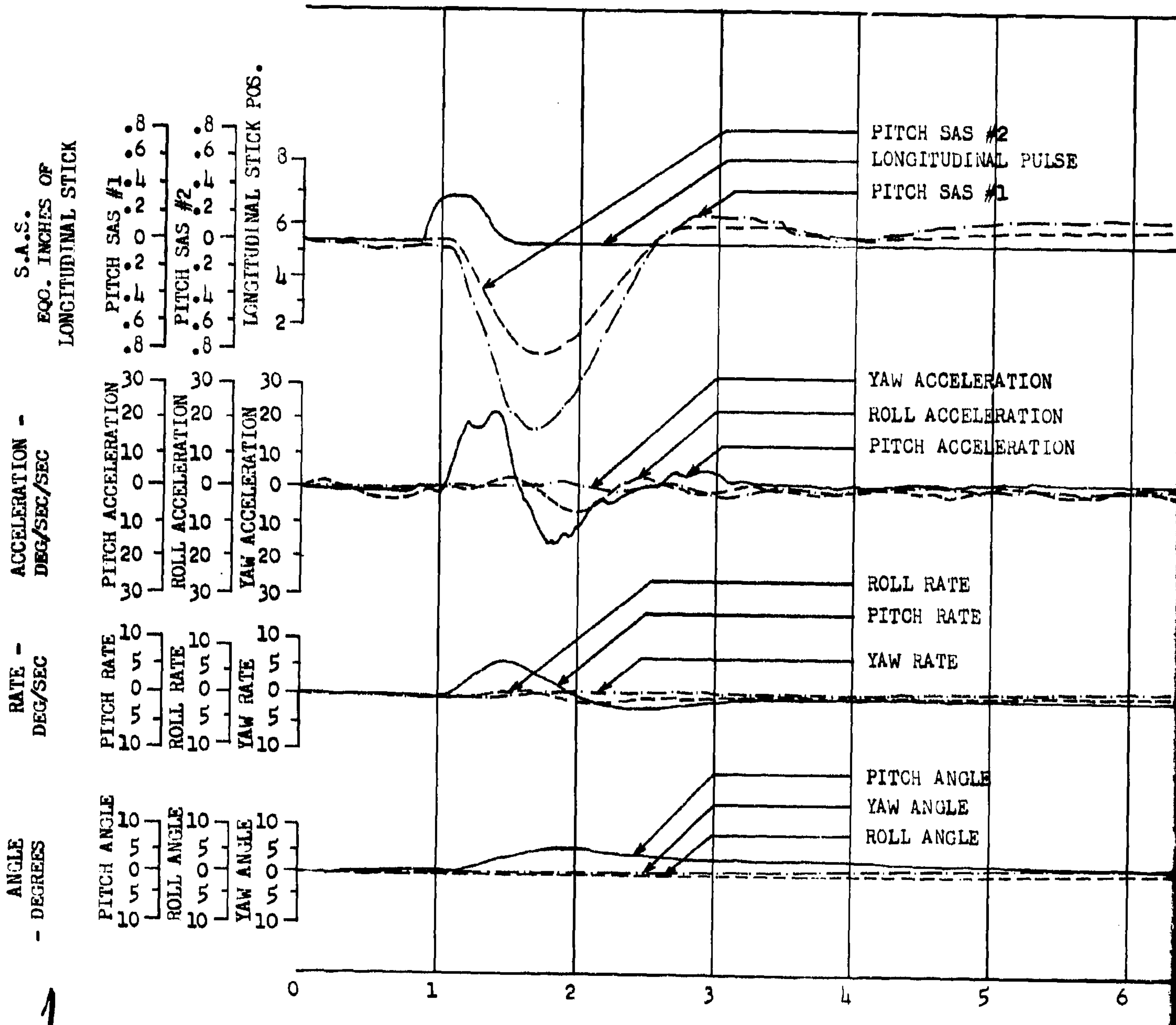


2

FIGURE NO. 179
TIME HISTORY OF DYNAMIC STABILITY
CH-47B U.S.A. S/N 66-19100
LONGITUDINAL STICK, 1 INCH AFT PULSE

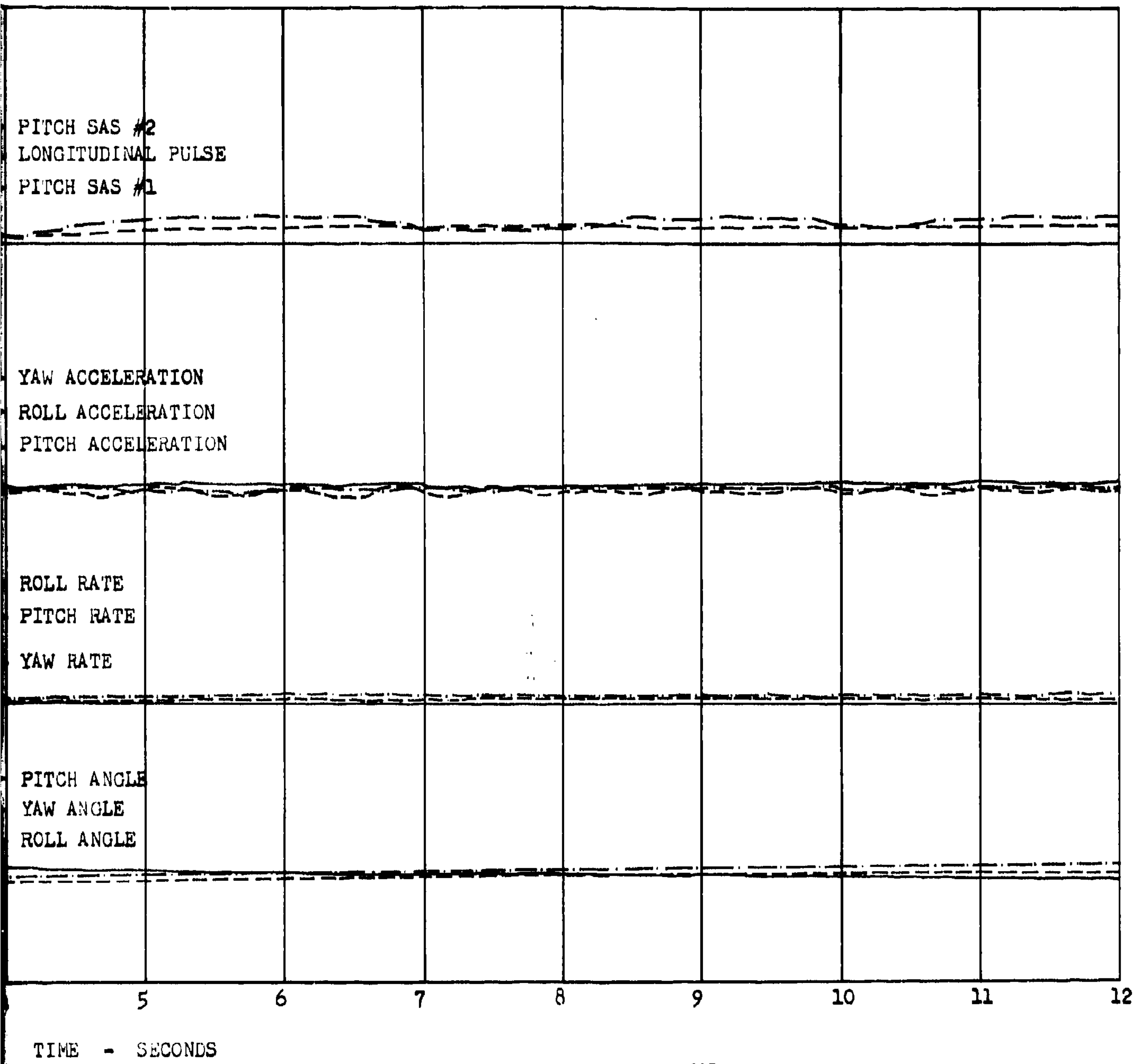
TRIM AIRSPEED = 70 KCAS
AVERAGE GROSS WEIGHT = 36180 LBS
AVERAGE C.G. = 331.0 (MID)

AVERAGE D
AVERAGE R
S.A.S. CO



1

FIGURE NO. 179
TORY OF DYNAMIC STABILITY
U.S.A. S/N 66-19100
L STICK, 1 INCH AFT PULSE
AVERAGE DENSITY ALTITUDE = 3400 FEET
BS AVERAGE ROTOR SPEED = 230 RPM
S.A.S. CONDITION = ON



2

FIGURE NO. 180
TIME HISTORY OF DYNAMIC STABILITY
CH-47B U.S.A. S/N 66-19100
LONGITUDINAL STICK, 1 INCH FWD. PULSE

TRIM AIRSPEED = 115 KCAS
AVERAGE GROSS WEIGHT = 33320 LBS.
AVERAGE C.G. = 313.2 (FWD)

AVERAGE DENSITY ALT
AVERAGE ROTOR SPEED
S.A.S. CONDITION =O

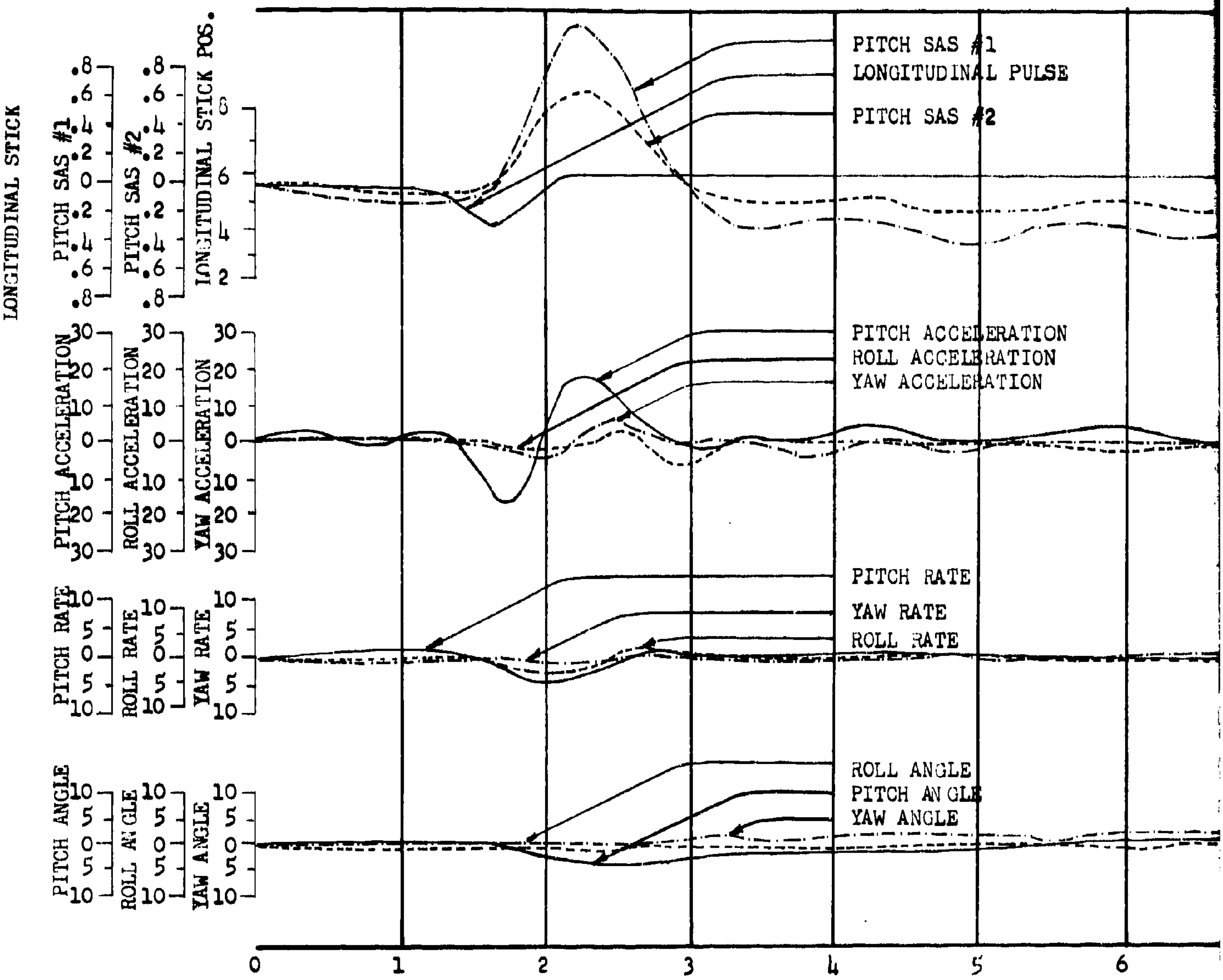
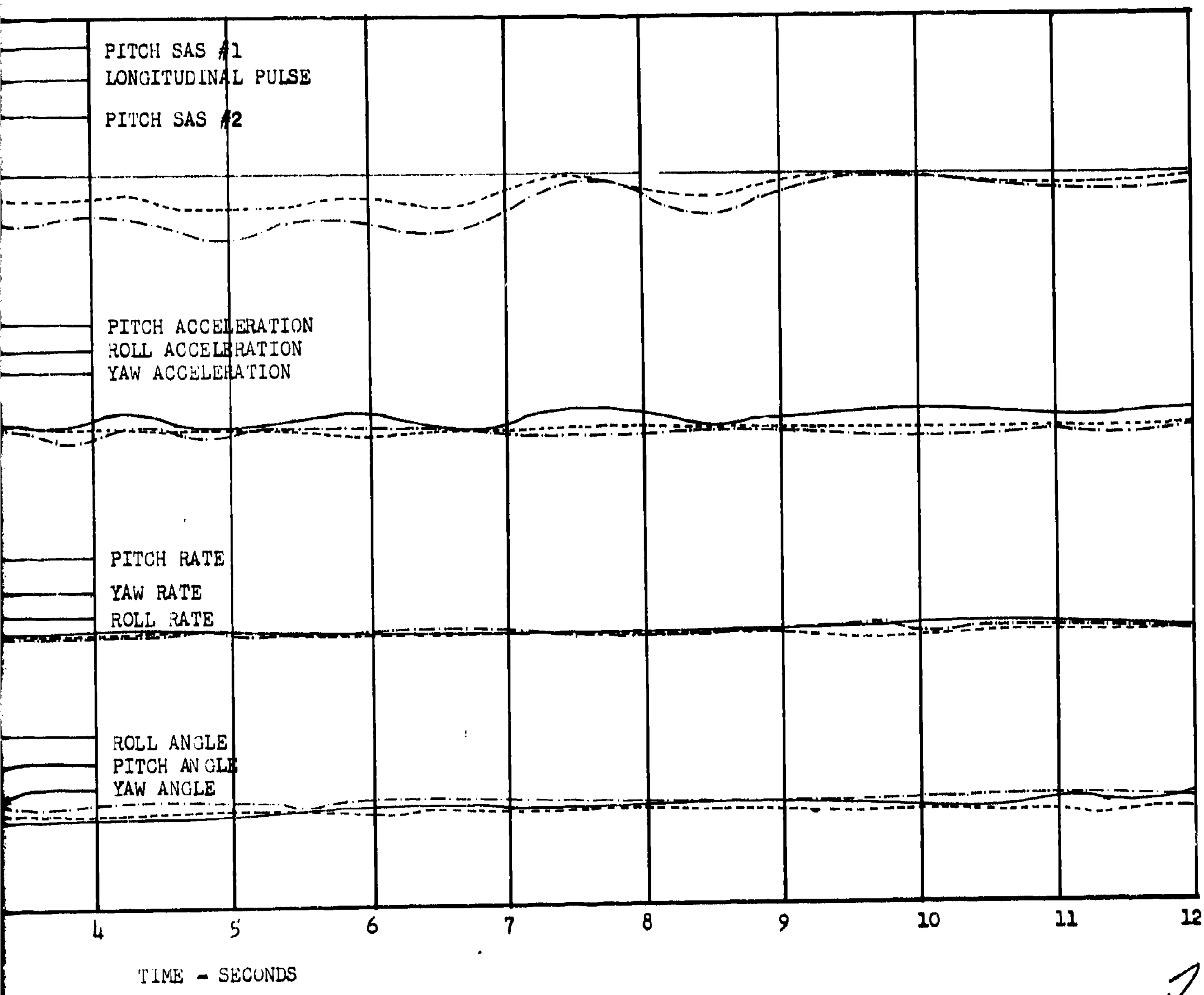


FIGURE NO. 180
HISTORY OF DYNAMIC STABILITY
B U.S.A. S/N 66-19100
DINAL STICK, 1 INCH FWD. PULSE
B AVERAGE DENSITY ALTITUDE = 5440 FEET
33320 LBS. AVERAGE ROTOR SPEED = 230 RPM
WD) S.A.S. CONDITION =ON

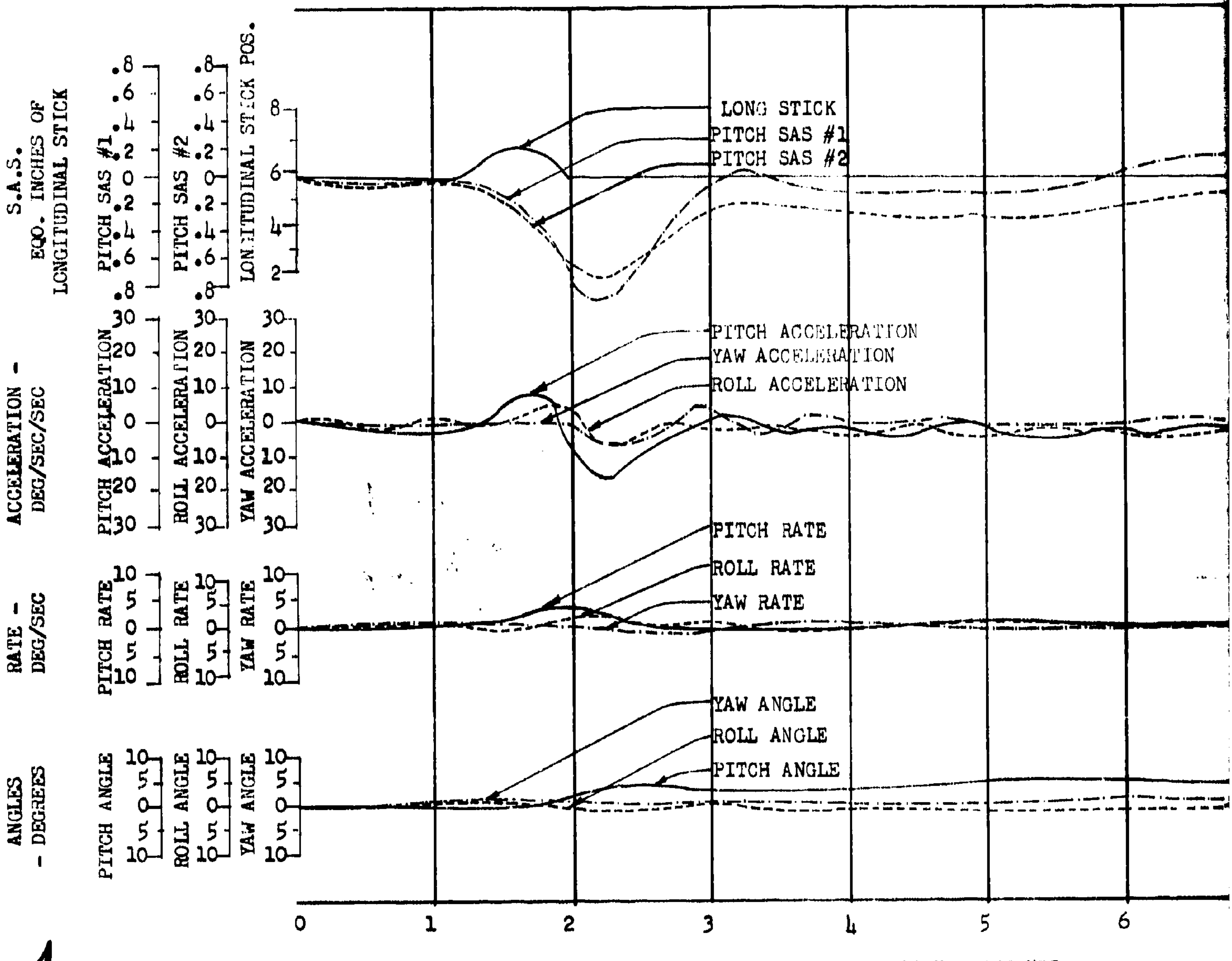


2

FIGURE NO. 181
TIME HISTORY OF DYNAMIC STABILITY
CH-47B U.S.A. S/N 66-19100
LONGITUDINAL STICK, 1 INCH AFT. PULSE

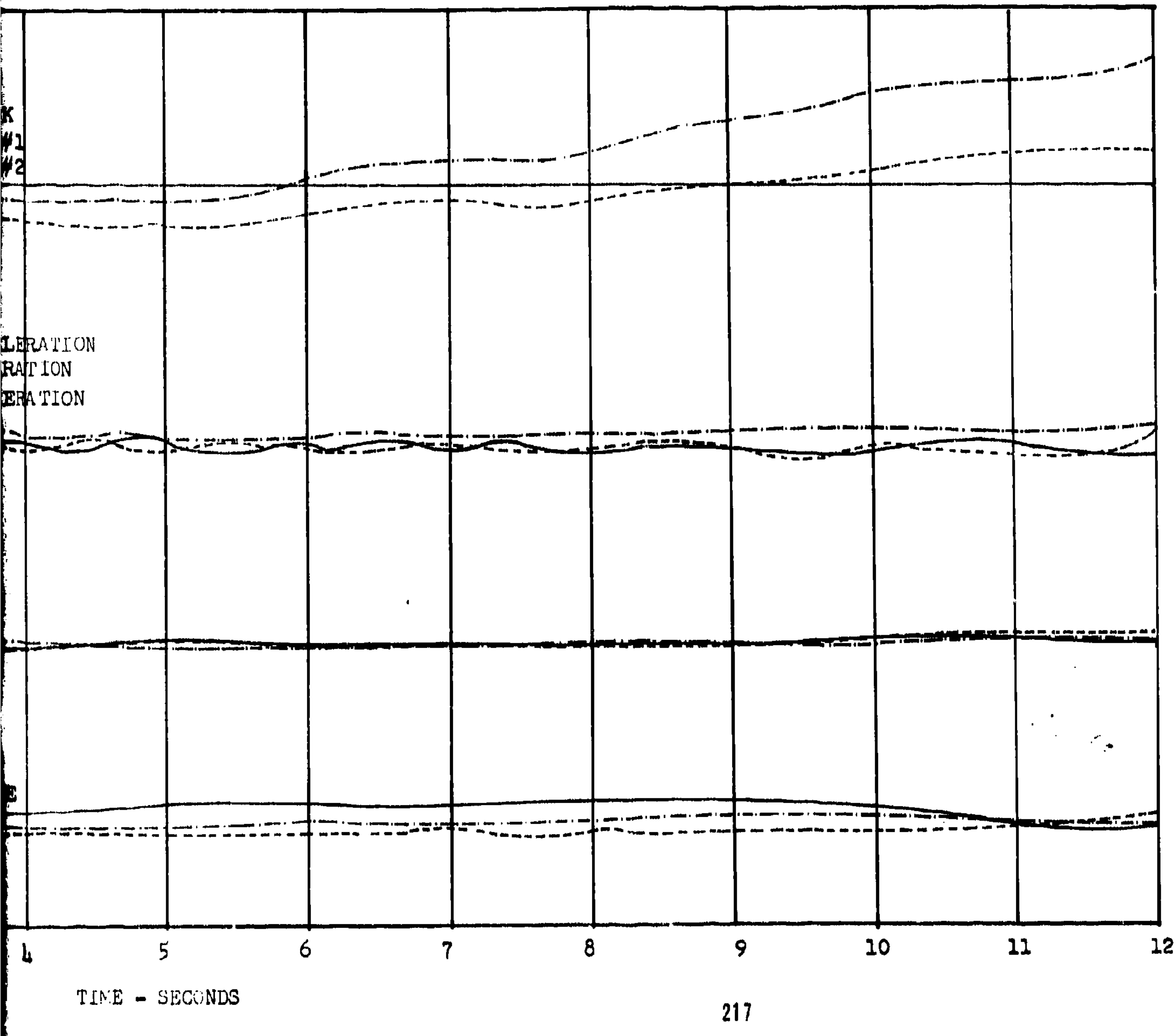
TRIM AIRSPEED = 115 KCAS
AVERAGE GROSS WEIGHT = 33320 LBS.
AVERAGE C.G. = 313.2 (FWD)

AVERAGE DENSITY ALTI
AVERAGE ROTOR SPEED
S.A.S. CONDITION =ON



1

FIGURE NO. 181
RY OF DYNAMIC STABILITY
U.S.A. S/N 66-19100
STICK, 1 INCH AFT. PULSE
AVERAGE DENSITY ALTITUDE = 5440 FEET
LBS. AVERAGE ROTOR SPEED = 230 RPM
S.A.S. CONDITION =ON

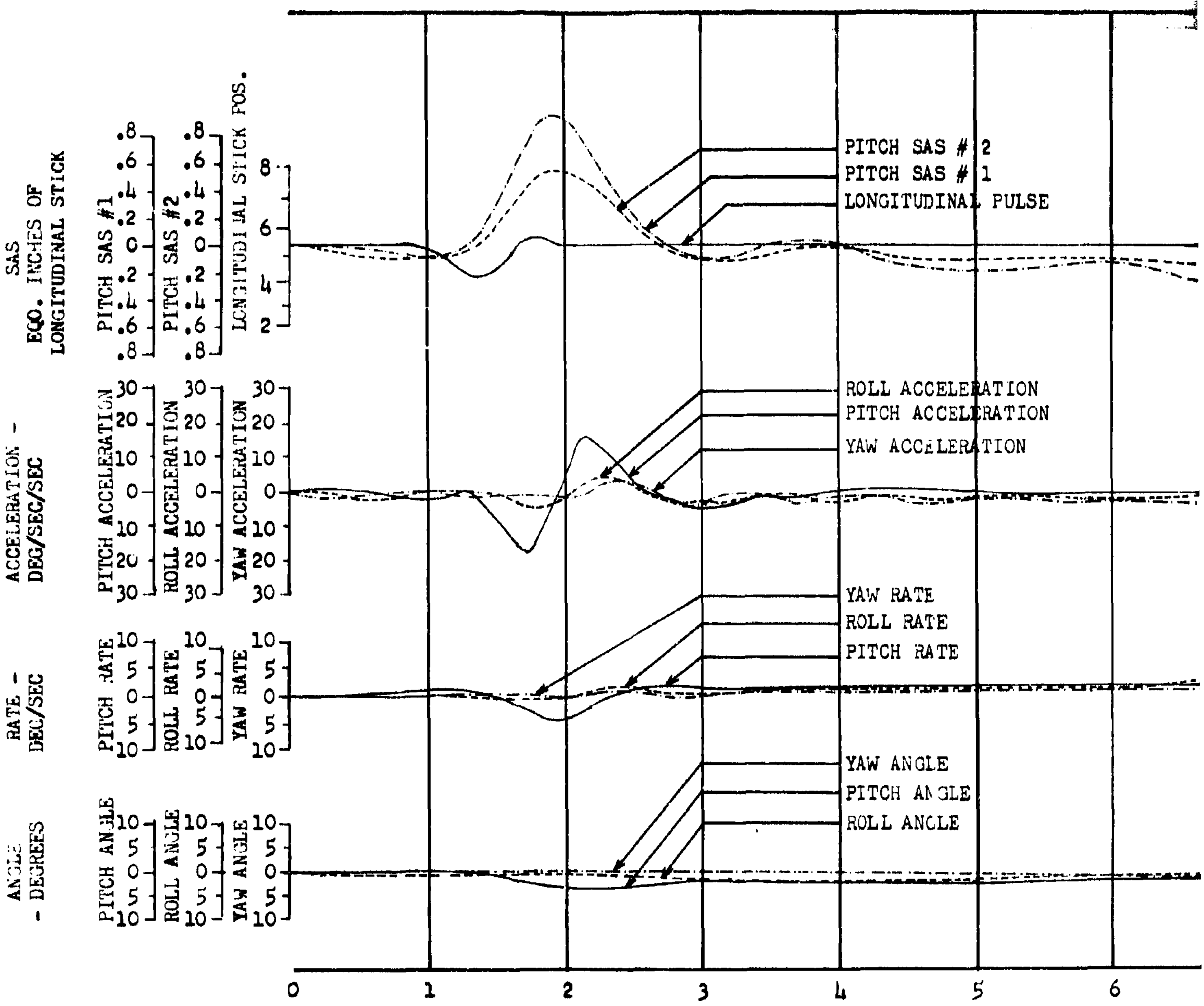


2

FIGURE NO. 182
TIME HISTORY OF DYNAMIC STABILITY
CH-47 B U.S.A. S/N 66-19100
LONGITUDINAL STICK, 1 INCK FWD. PULSE

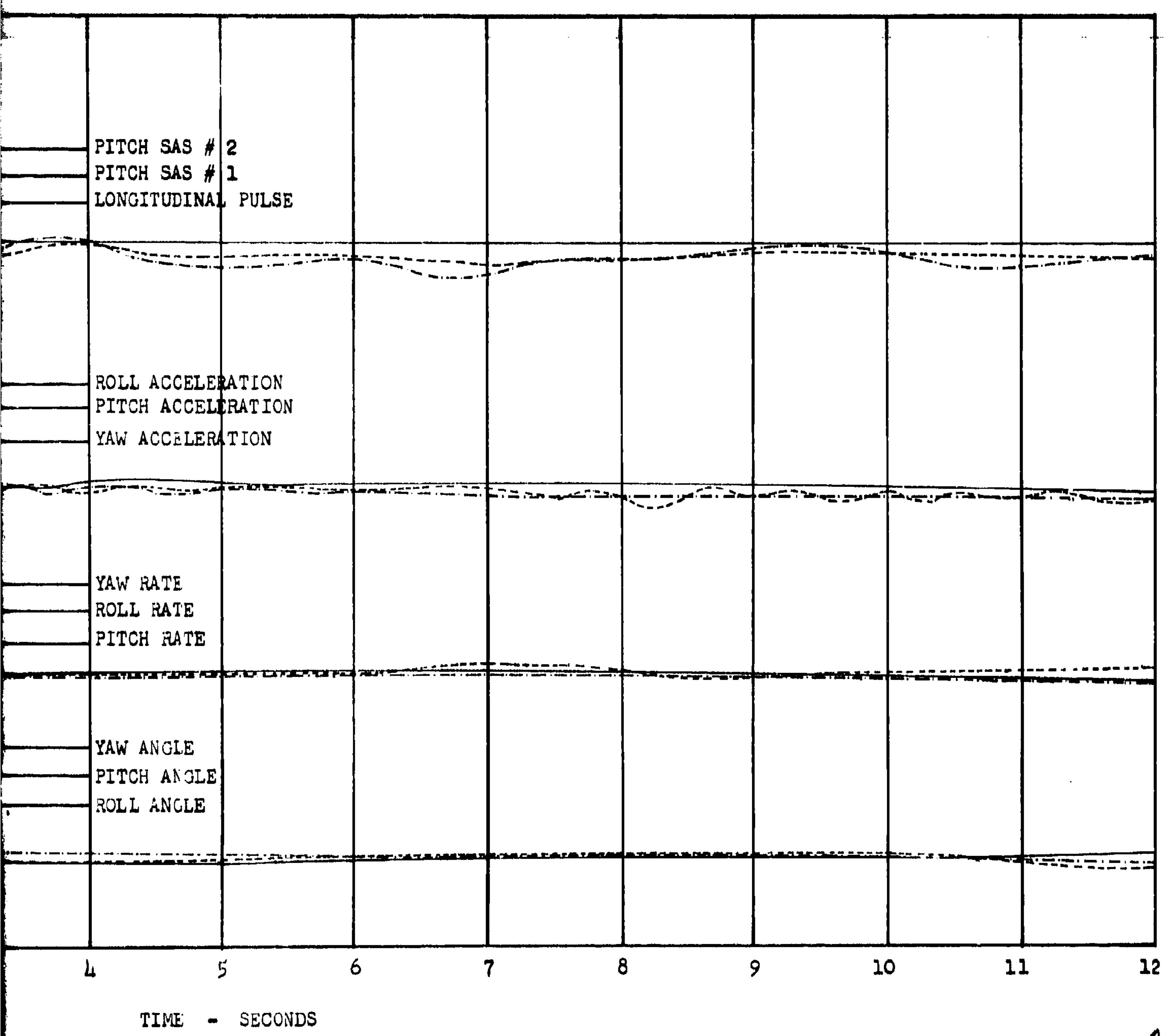
TRIM AIRSPEED = 70 KCAS
AVERAGE GROSS WEIGHT = 28490 LBS.
AVERAGE C.G. = 330.3 (MID)

AVERAGE DENSITY ALT
AVERAGE ROTOR SPEED
S.A.S. CONDITION =



1

FIGURE NO. 182
HISTORY OF DYNAMIC STABILITY
B U.S.A. S/N 66-19100
INAL STICK, 1 INCK FWD. PULSE
AVERAGE DENSITY ALTITUDE = 3100 FEET
28490 LBS. AVERAGE ROTOR SPEED = 225 RPM
ID) S.A.S. CONDITION = ON

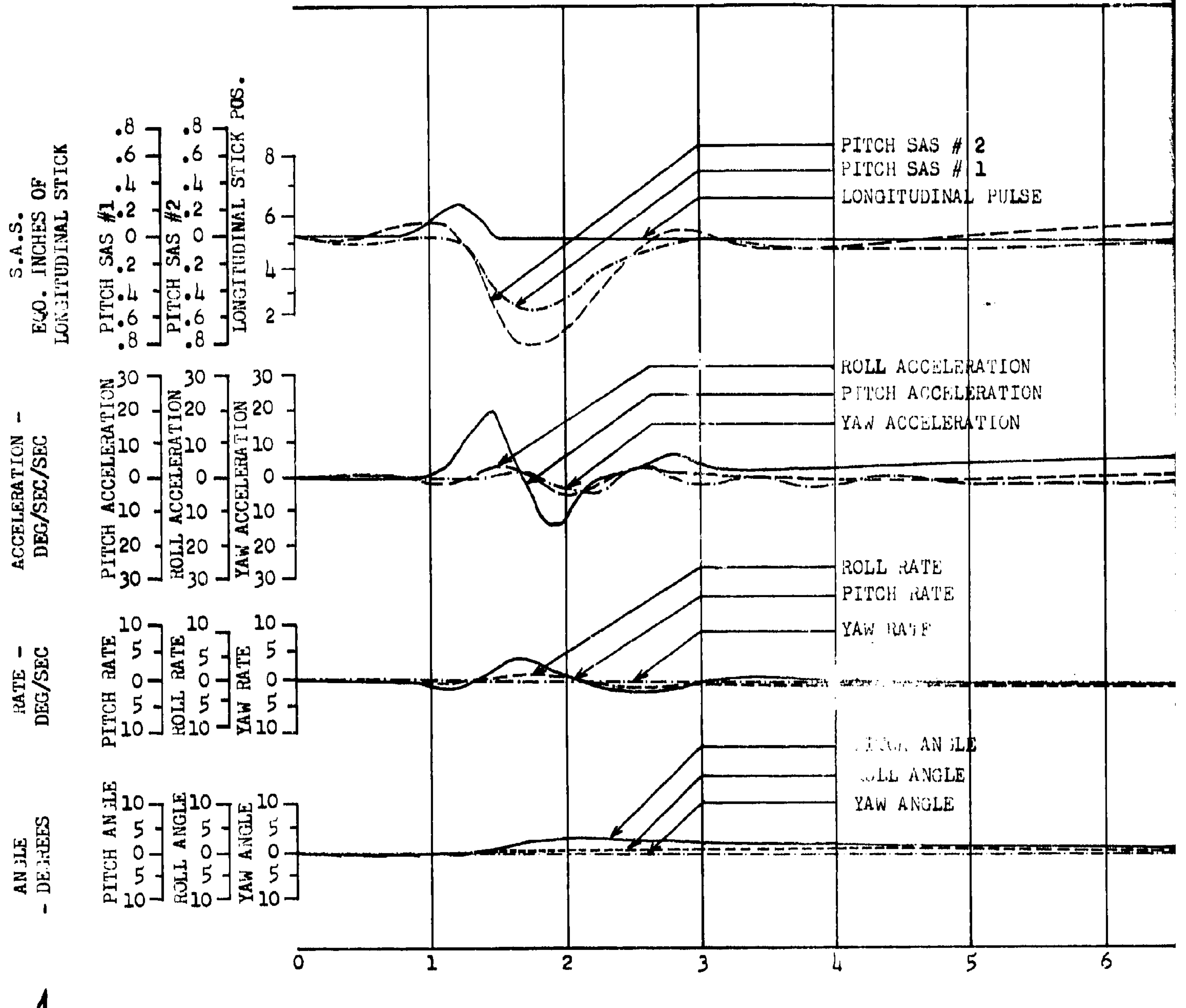


2

FIGURE NO. 1?3
TIME HISTORY OF DYNAMIC STABILITY
CH-47B U.S.A. S/N 66-19100
LONGITUDINAL STICK, 1 INCH AFT PULSE

TRIM AIRSPEED = 70 KCAS
AVERAGE GROSS WEIGHT = 28145 LBS
AVERAGE C.G. = 331.0 (MID)

AVERAGE D
AVERAGE R
S.A.S. CO

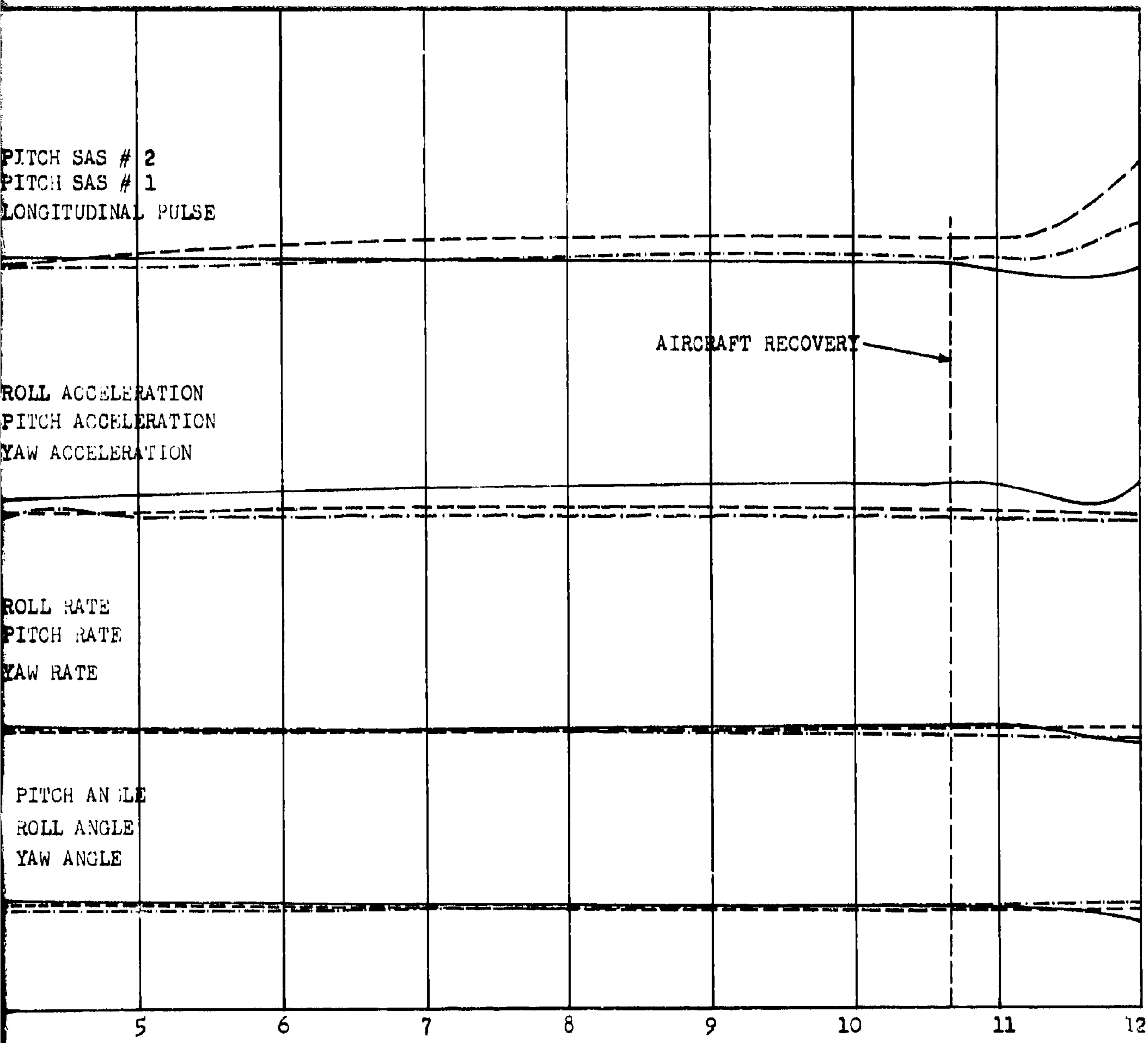


1

FIGURE NO. 183
RY OF DYNAMIC STABILITY
U.S.A. S/N 66-19100
L STICK, 1 INCH AFT PULSE

LBS

AVERAGE DENSITY ALTITUDE = 5265 FEET
AVERAGE ROTOR SPEED = 225 RPM
S.A.S. CONDITION = ON



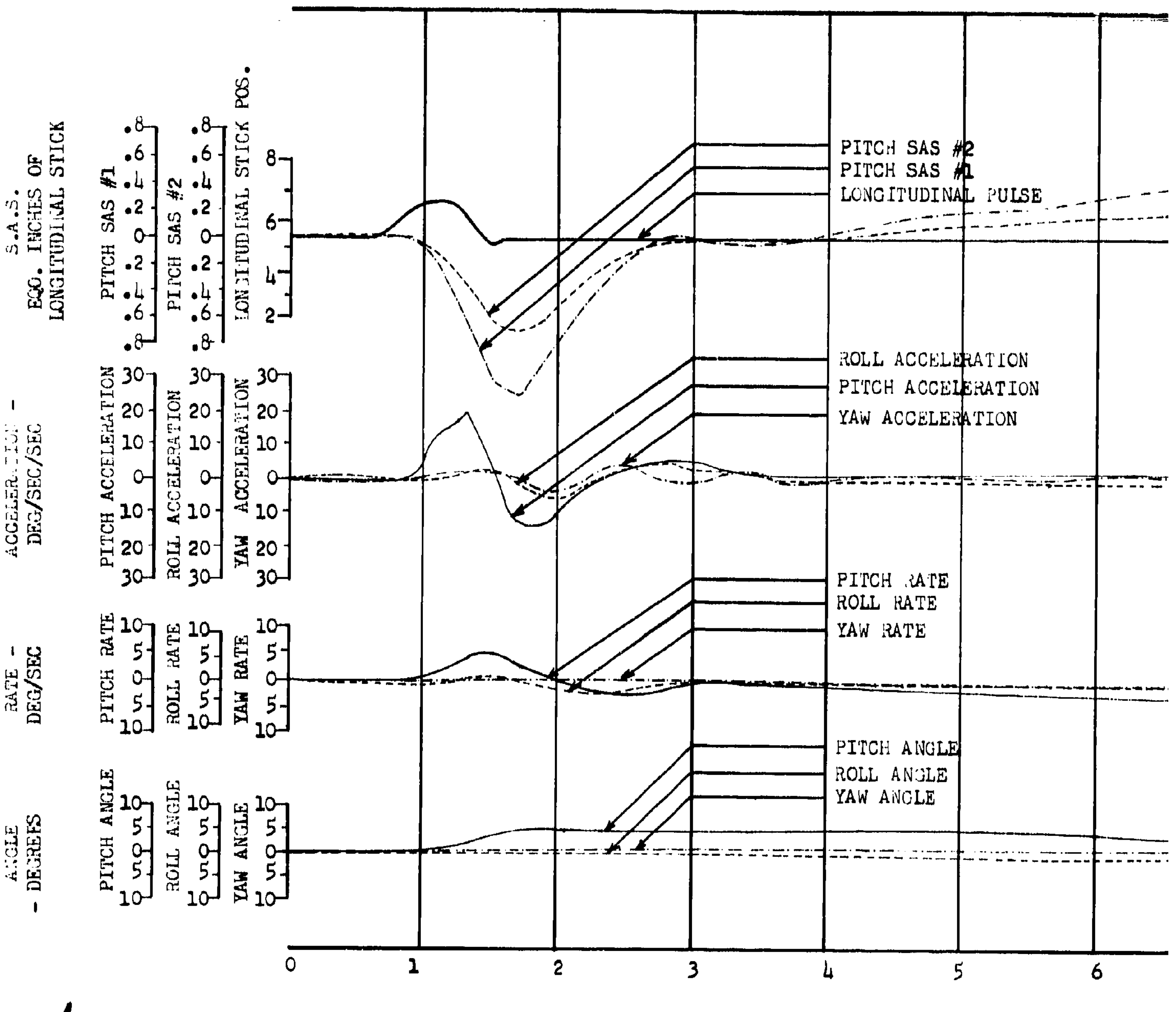
TIME - SECONDS

2

FIGURE NO. 184
TIME HISTORY OF DYNAMIC STABILITY
CH-47B U.S.A. S/N 66-19100
LONGITUDINAL STICK, 1 INCH AFT PULSE

TRIM AIRSPEED = 70 KCAS
AVERAGE GROSS WEIGHT = 26450 LBS
AVERAGE C.G. 331.0 (MID)

AVERAGE D
AVERAGE R
S.A.S. CO

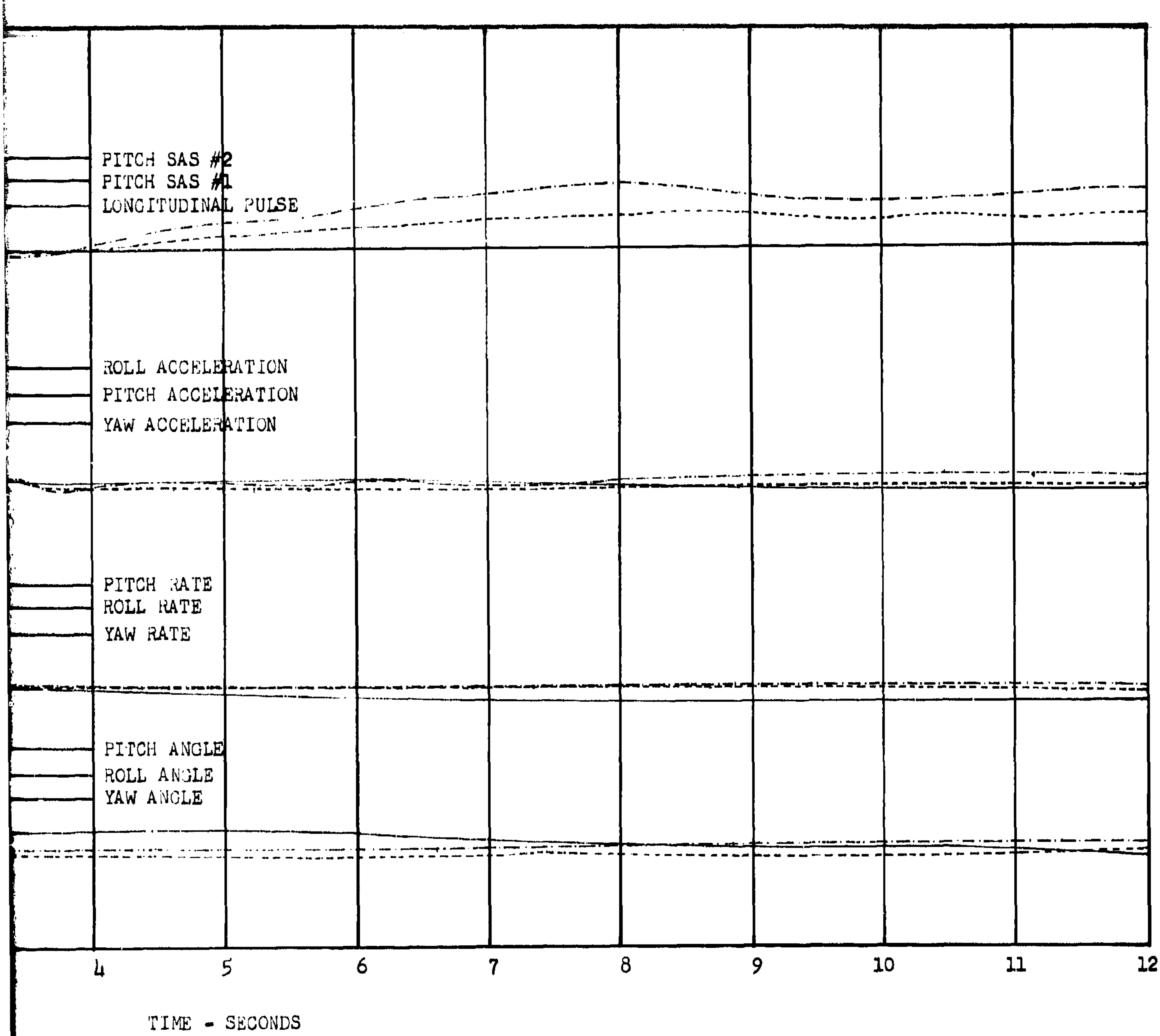


1

FIGURE NO. 104
E HISTORY OF DYNAMIC STABILITY
47B U.S.A. S/N 66-19100
TUDINAL STICK, 1 INCH AFT PULSE

S
: 26450 LBS
ID)

AVERAGE DENSITY ALTITUDE = 10080 FEET
AVERAGE ROTOR SPEED = 225 RPM
S.A.S. CONDITION = ON

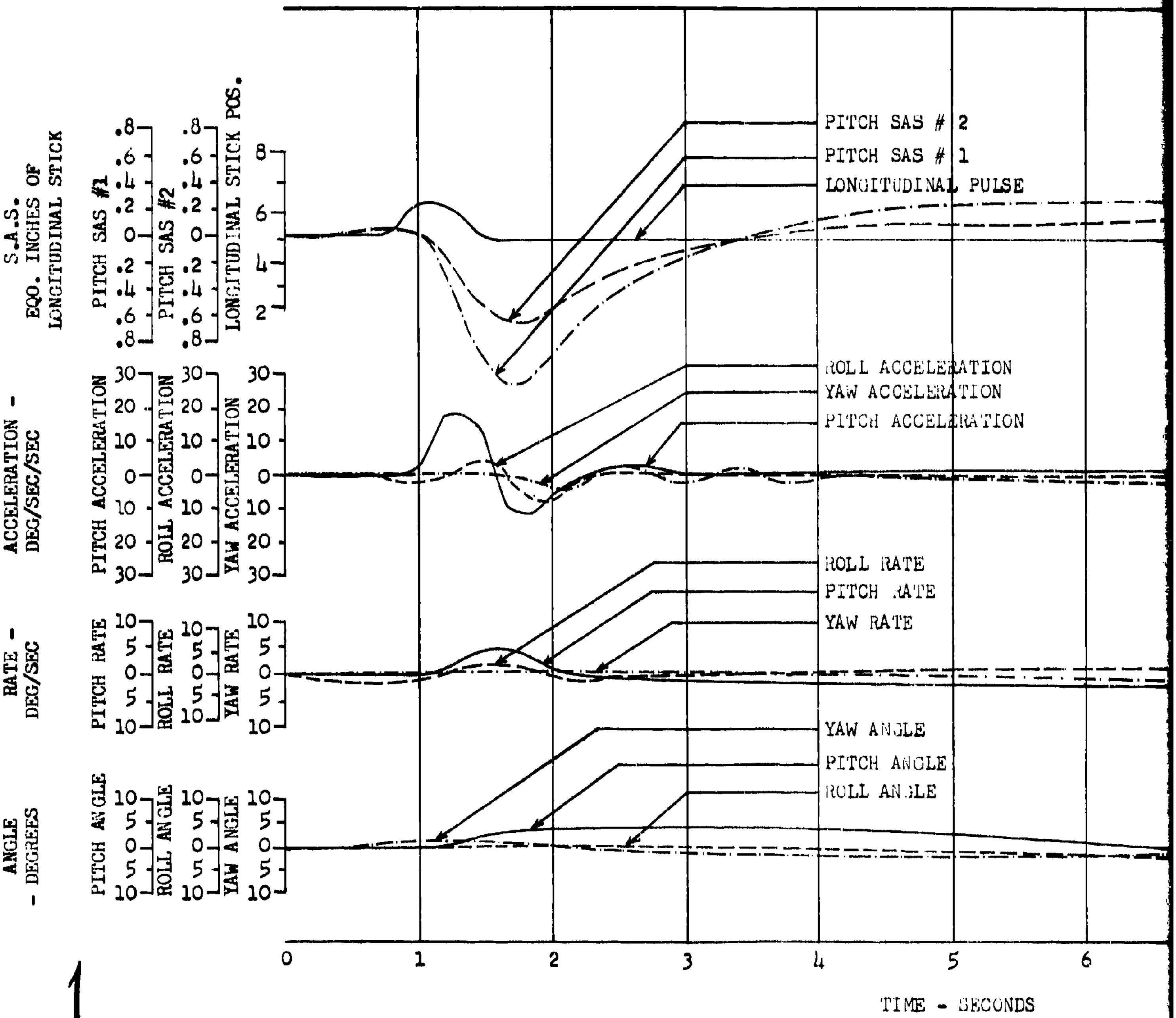


2

FIGURE NO. 105
TIME HISTORY OF DYNAMIC STABILITY
CH-47B U.S.A. S/N 66-19100
LONGITUDINAL STICK, 1 INCH AFT PULSE

TRIM AIRSPEED = 100 KCAS
AVERAGE GROSS WEIGHT = 26310 LBS
AVERAGE C.G. = 331.0 (MID)

AVERAGE
AVERAGE
S.A.S. C

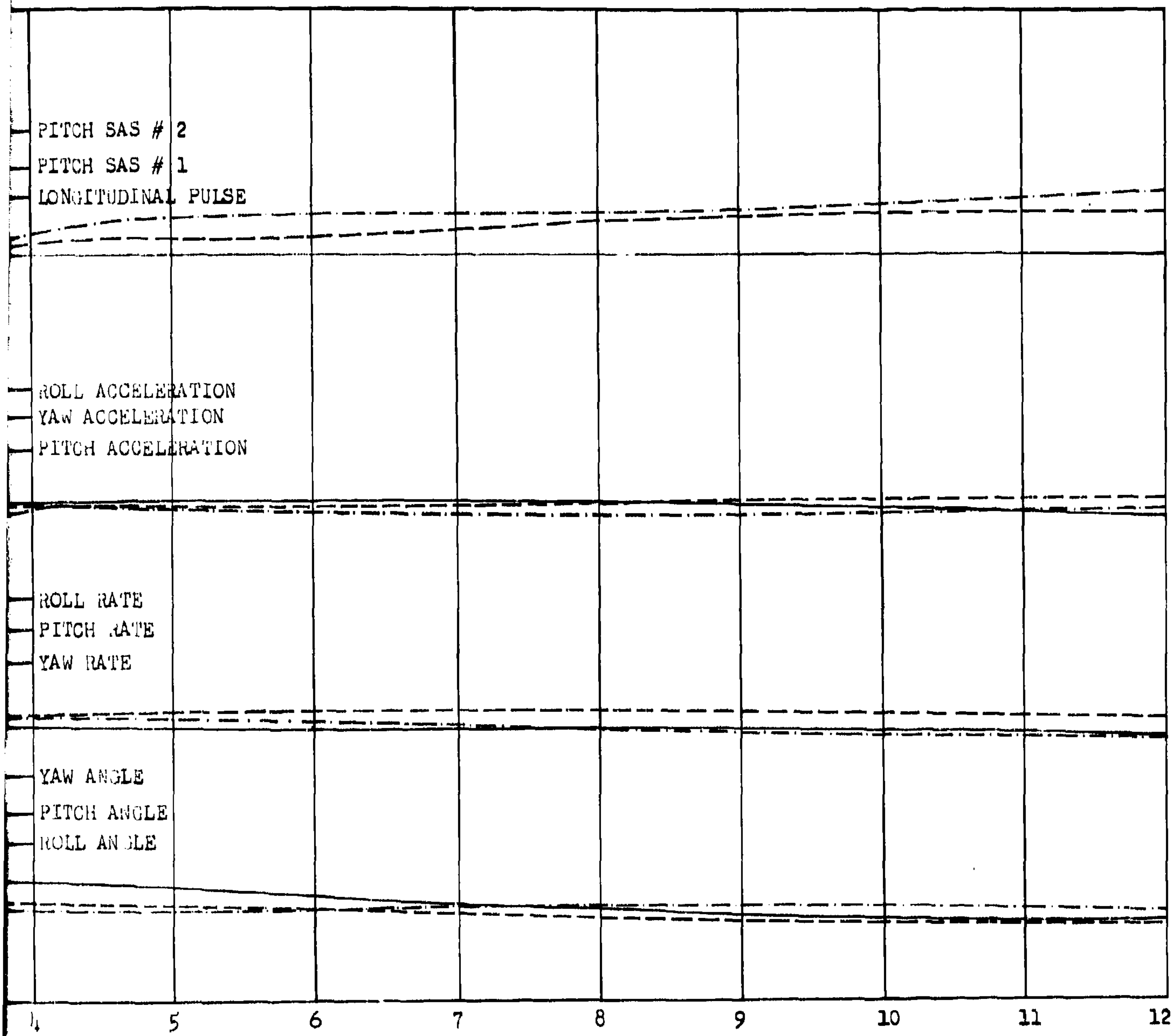


1

FIGURE NO. 1?5
STORY OF DYNAMIC STABILITY
U.S.A. S/N 66-19100
INAL STICK, 1 INCH AFT PULSE

LBS

AVERAGE DENSITY ALTITUDE = 10020 FEET
AVERAGE ROTOR SPEED = 225 RPM
S.A.S. CONDITION = ON

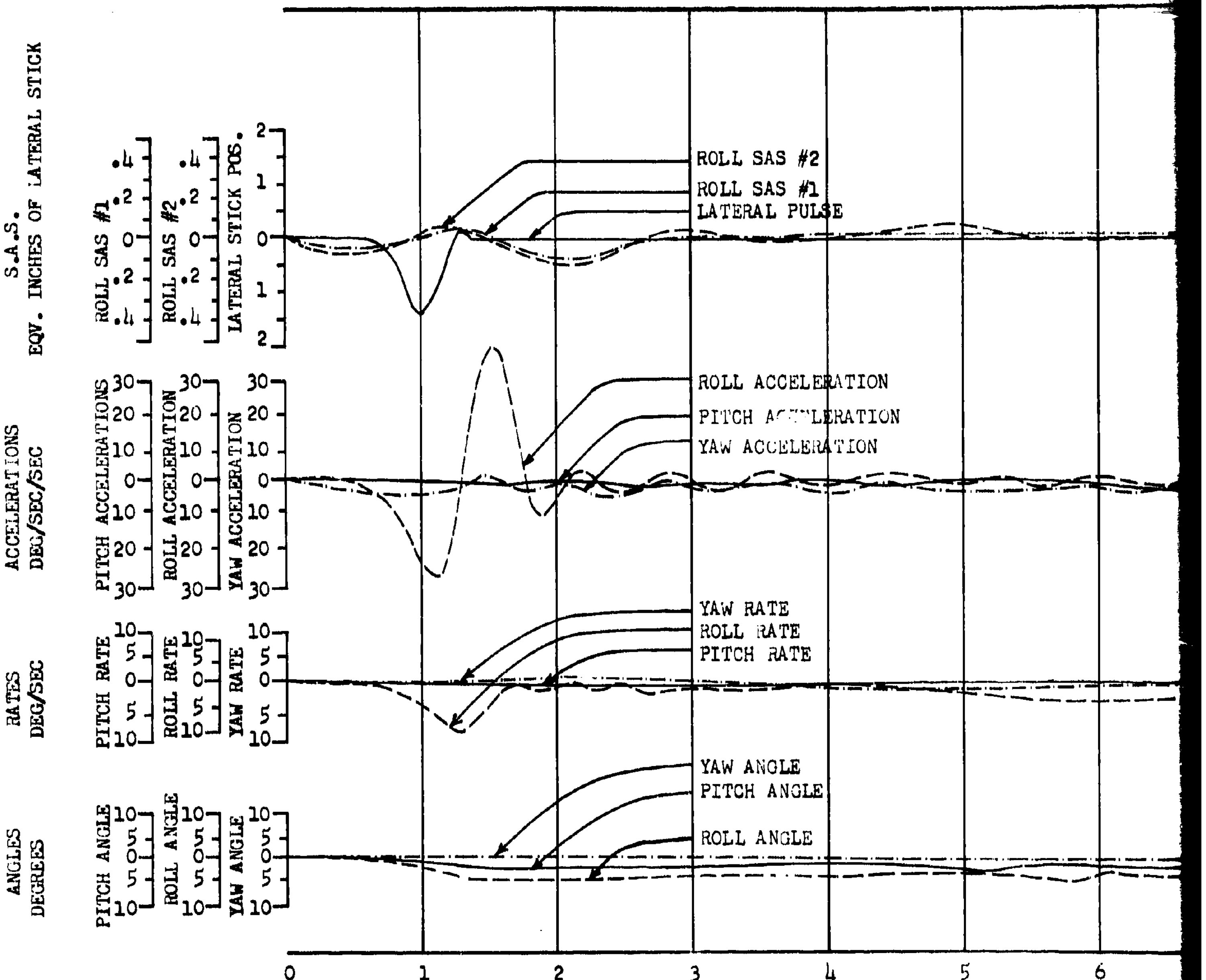


2

FIGURE NO. 186
TIME HISTORY OF DYNAMIC STABILITY
CH-47B U.S.A. S/N 66-19100
LATERAL STICK, 1 INCH LEFT PULSE

TRIM AIRSPEED - 115 KCAS
AVERAGE GROSS WEIGHT = 33320 LBS
AVERAGE C.G.=313.8

AVERAGE DENSITY ALT
AVERAGE ROTOR SPEED
S.A.S. CONDITION =

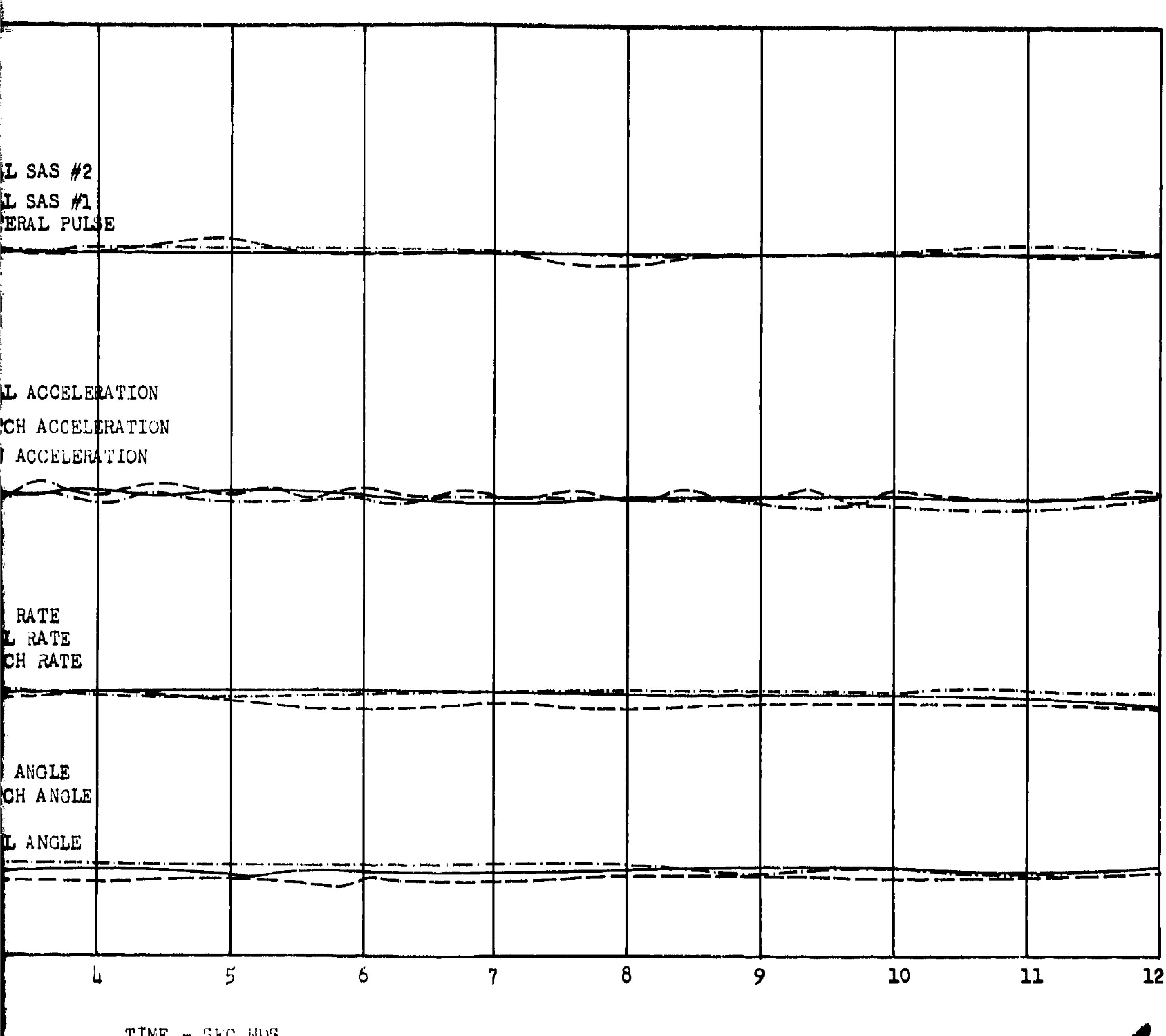


1

FIGURE NO. 186
ISTORY OF DYNAMIC STABILITY
U.S.A. S/N 66-19100
STICK, 1 INCH LEFT PULSE

KCAS
T = 33320 LBS

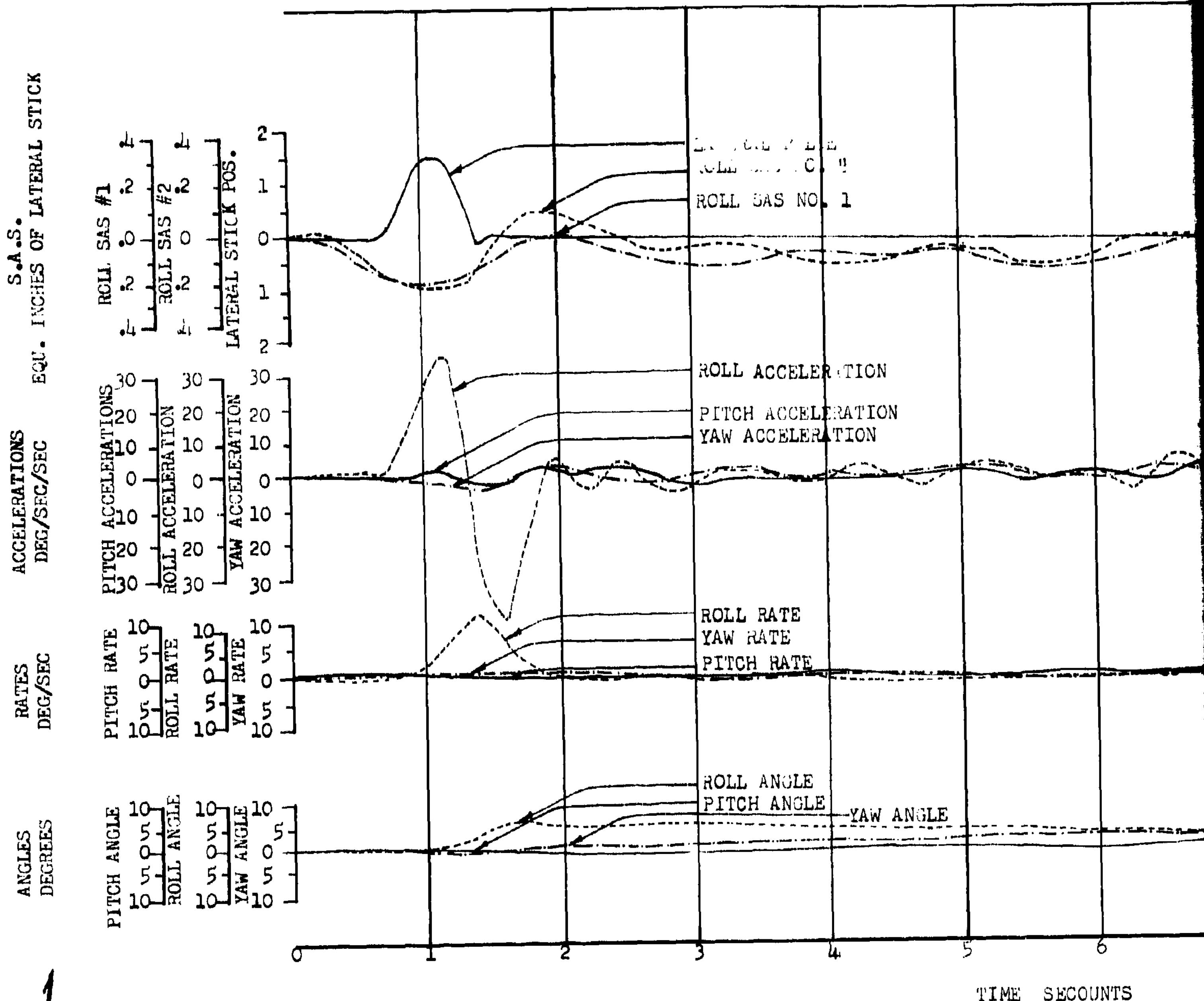
AVERAGE DENSITY ALTITUDE = 5440 FEET
AVERAGE ROTOR SPEED = 230 RPM
S.A.S. CONDITION = ON



2

FIGURE NO. 187
TIME HISTORY OF DYNAMIC STABILITY
CH-47B U.S.A. S/N 66-1910

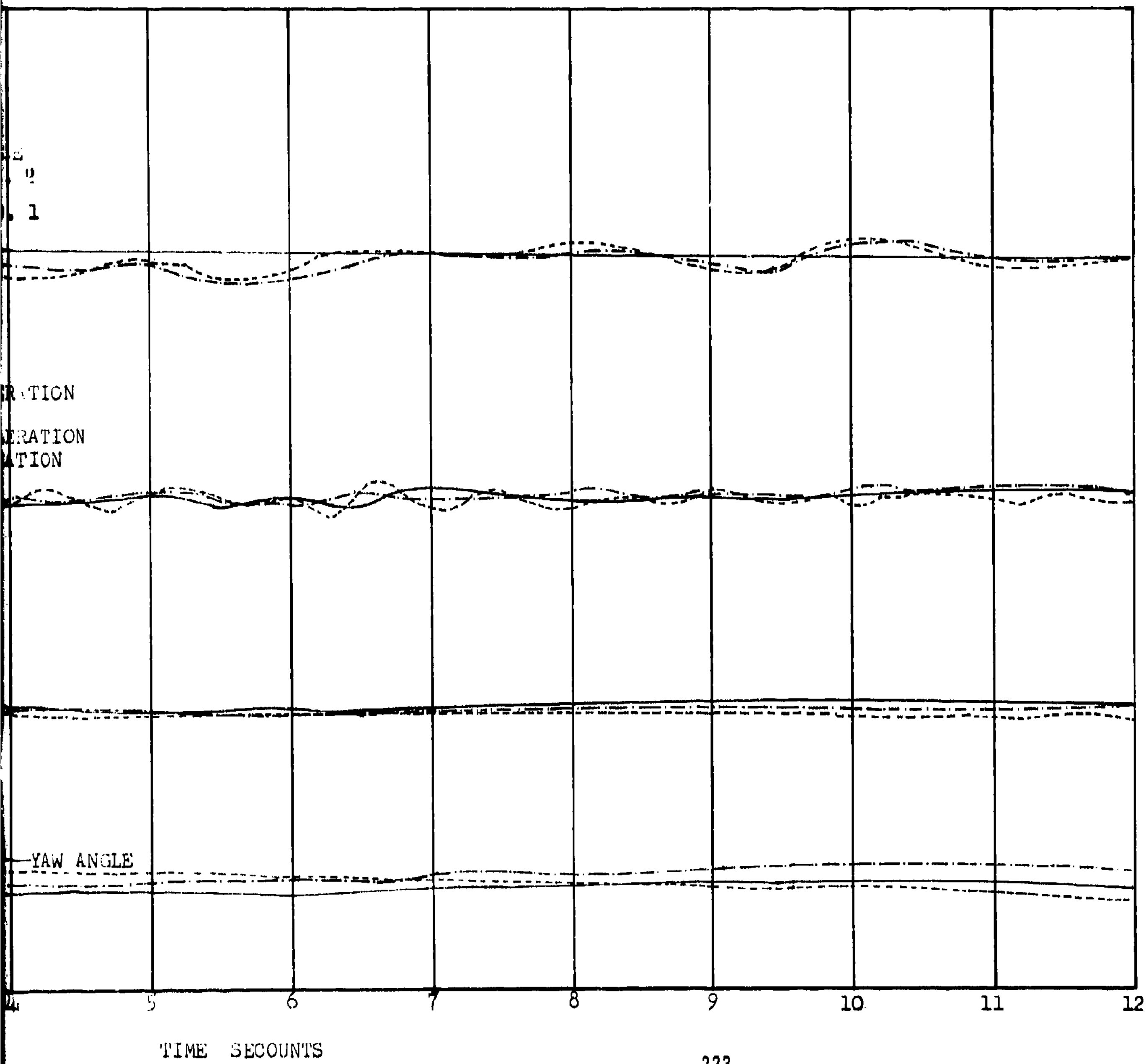
LATERAL STICK, 1 INCH RIGHT PULSE
TRIM AIRSPEED = 110 KCAS
AVERAGE GROSS WEIGHT = 33320 LBS.
AVERAGE C.G. = 313.2 (FWD.)
AVERAGE DE
AVERAGE RO
S.A.S. O



1

FIGURE NO. 187
TIME HISTORY OF DYNAMIC STABILITY
CH-47B U.S.A. S/N 66-19100

LATERAL STICK, 1 INCH RIGHT PULSE
D = 110 KCAS AVERAGE DENSITY ALTITUDE = 5440 feet
S WEIGHT = 33320 LBS. AVERAGE ROTOR SPEED = 230 RPM
= 313.2 (FWD.) S.A.S. CONFIGURATION = ON



2

FIGURE NO. 188

TIME HISTORY OF LONGITUDINAL CONTROL STICK

MANEUVERING STABILITY

CH-47B U.S.A. S/N 66-19100

HOVER

AVERAGE GROSS WEIGHT = 31510 LB. TRIM AIRSPEED = 0.0 KCAS.

AVERAGE C.G. = 310.1 (FWD) IN. AVERAGE ROTOR SPEED = 230 R.P.M.

AVERAGE DENSITY ALTITUDE = 10840 FT. S.A.S. - ON

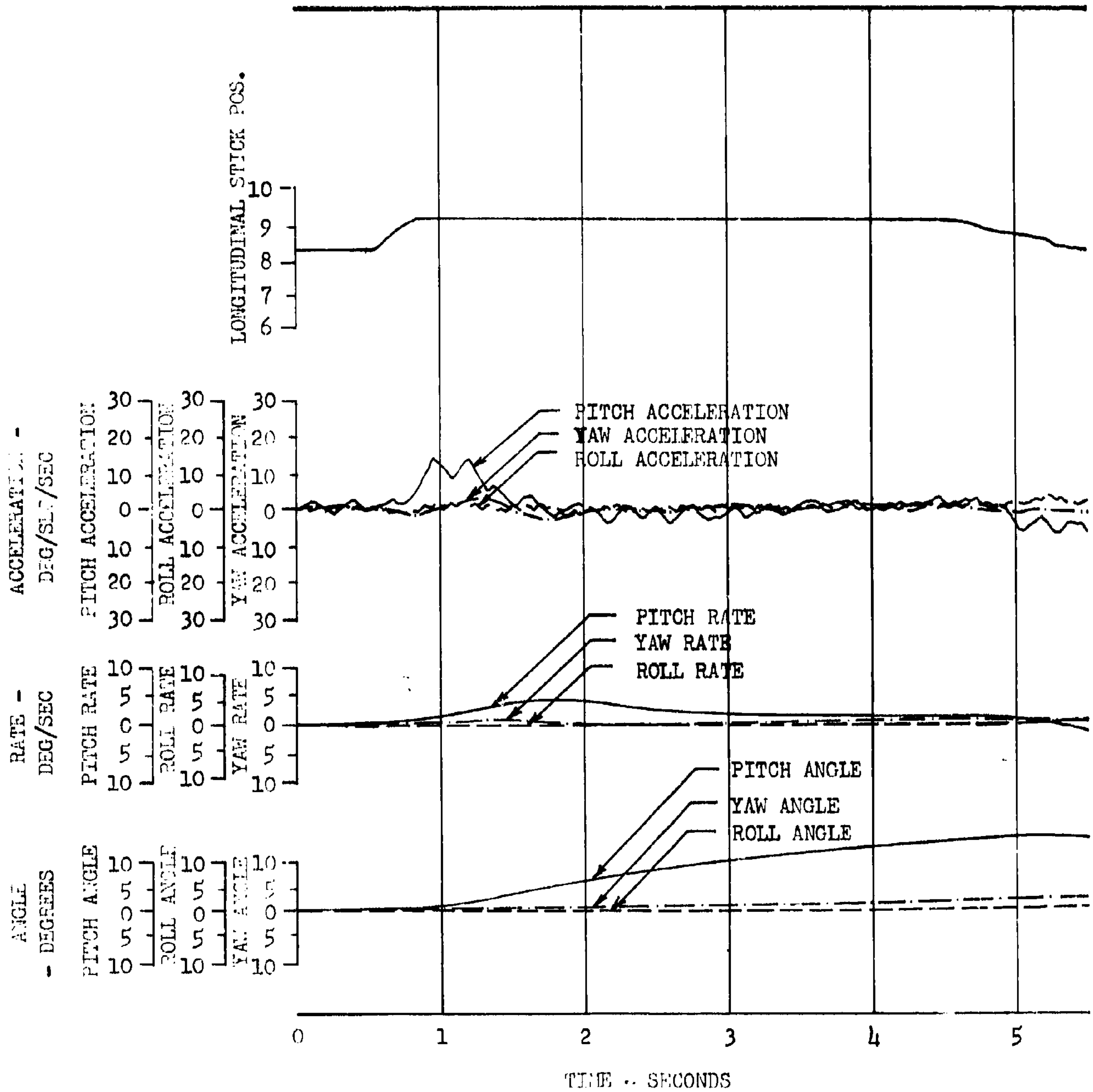


FIGURE NO. 189

TIME HISTORY OF LONGITUDINAL CONTROL STICK

MANEUVERING STABILITY

CH-47B U.S.A. S/N 66-19100

HOVER

AVERAGE GROSS WEIGHT = 37000 LB.
AVERAGE C.G. = 330.5 (MID) IN.
AVERAGE DENSITY ALTITUDE = 2400 FT.

TRIM AIRSPEED = 0.0 KCAS
AVERAGE ROTOR SPEED = 230 R.P.M.
S.A.S. - ON

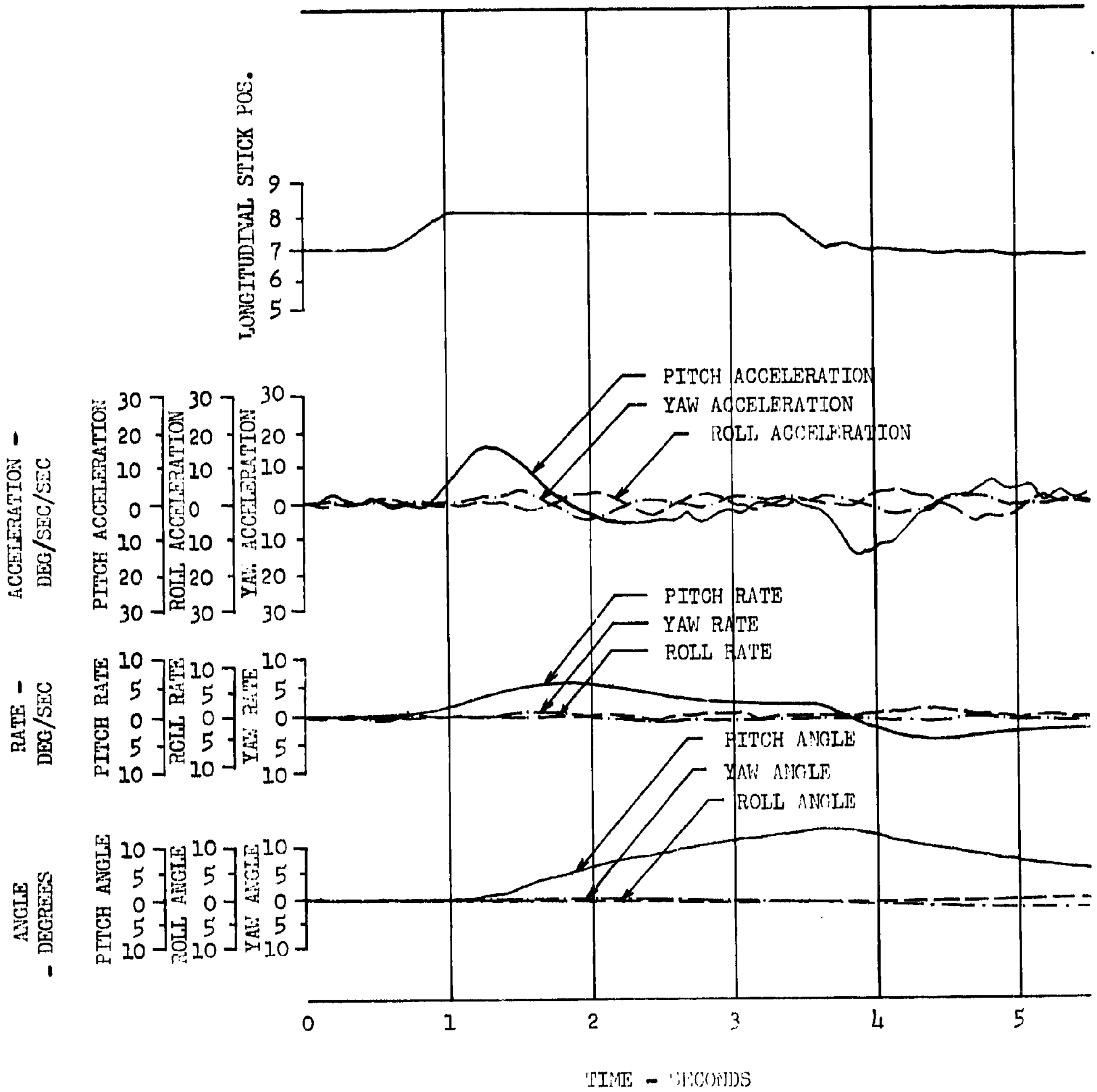


FIGURE NO. 190
TIME HISTORY OF LONGITUDINAL CONTROL STICK
MANEUVERING STABILITY
CH-47B U.S.A. S/N 66-19100

AVERAGE GROSS WEIGHT = 27350 LB.
AVERAGE C.G. = 330.8 (MID)
AVERAGE DENSITY ALTITUDE = 5500 FT.
TRIM AIRSPEED = 80.0 KCAS
AVERAGE ROTOR SPEED = 230 R.P.M.
S.A.S. - ON

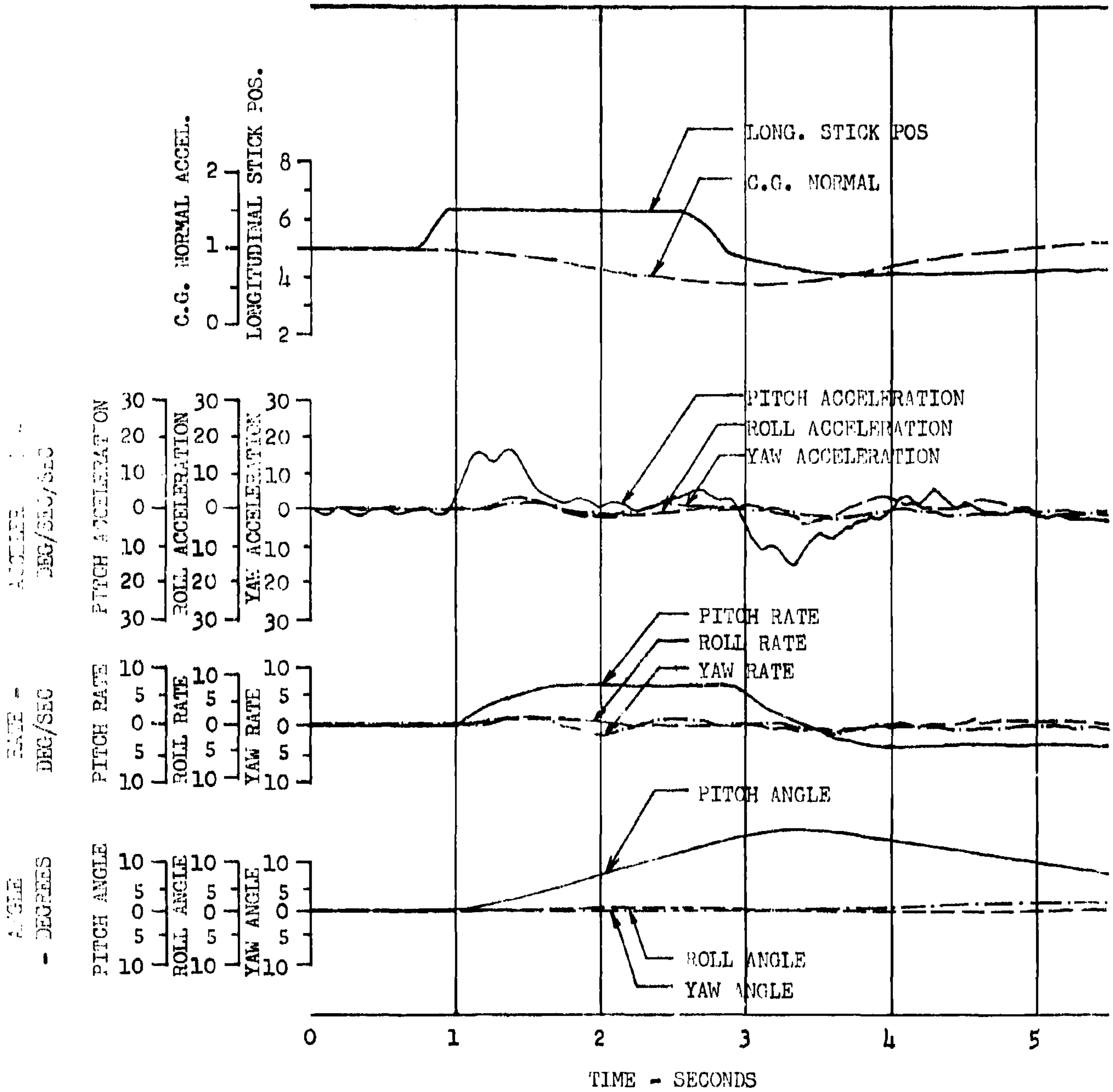


FIGURE NO. 191
TIME HISTORY OF LONGITUDINAL CONTROL STICK
MANEUVERING STABILITY
CH-47B U.S.A. S/N 66-19100

AVERAGE GROSS WEIGHT = 27350 LB.
AVERAGE C.G. = 330.8 (MID)
AVERAGE DENSITY ALTITUDE = 5500 FT.
TRIM AIRSPEED = 96.0 KCAS
AVERAGE ROTOR SPEED = 230 R.P.M.
S.A.S. - ON

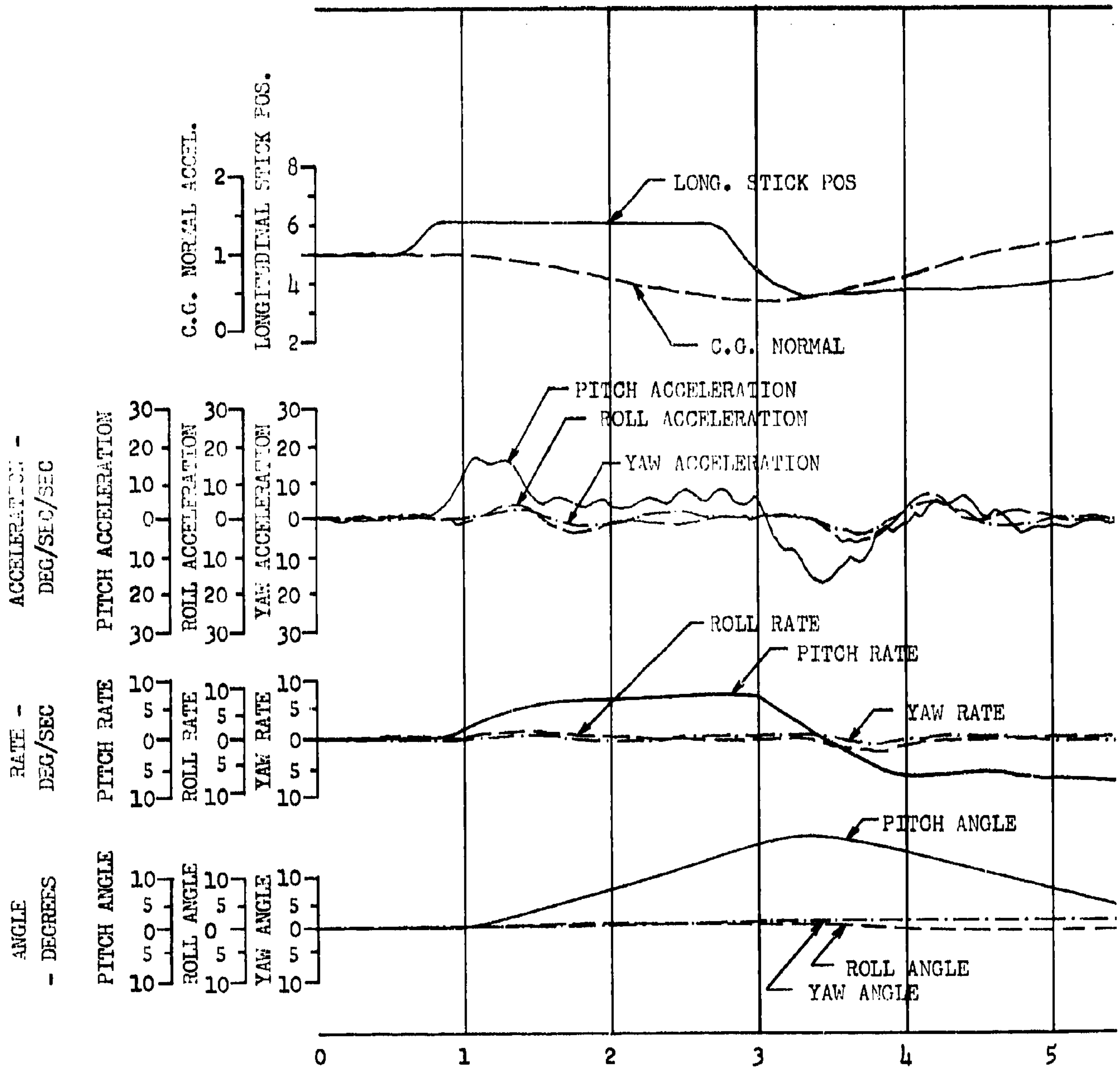


FIGURE NO. 192
TIME HISTORY OF LONGITUDINAL CONTROL STICK
MANEUVERING STABILITY
CH-47B U.S.A. S/N 66-19100

AVERAGE GROSS WEIGHT = 37400 LB.
AVERAGE C.G. = 335.8 (AFT)
AVERAGE DENSITY ALTITUDE = 4850 FT.
TRIM AIRSPEED = 81.0 KCAS
AVERAGE ROTOR SPEED = 230 R.P.M.
S.A.S. - ON

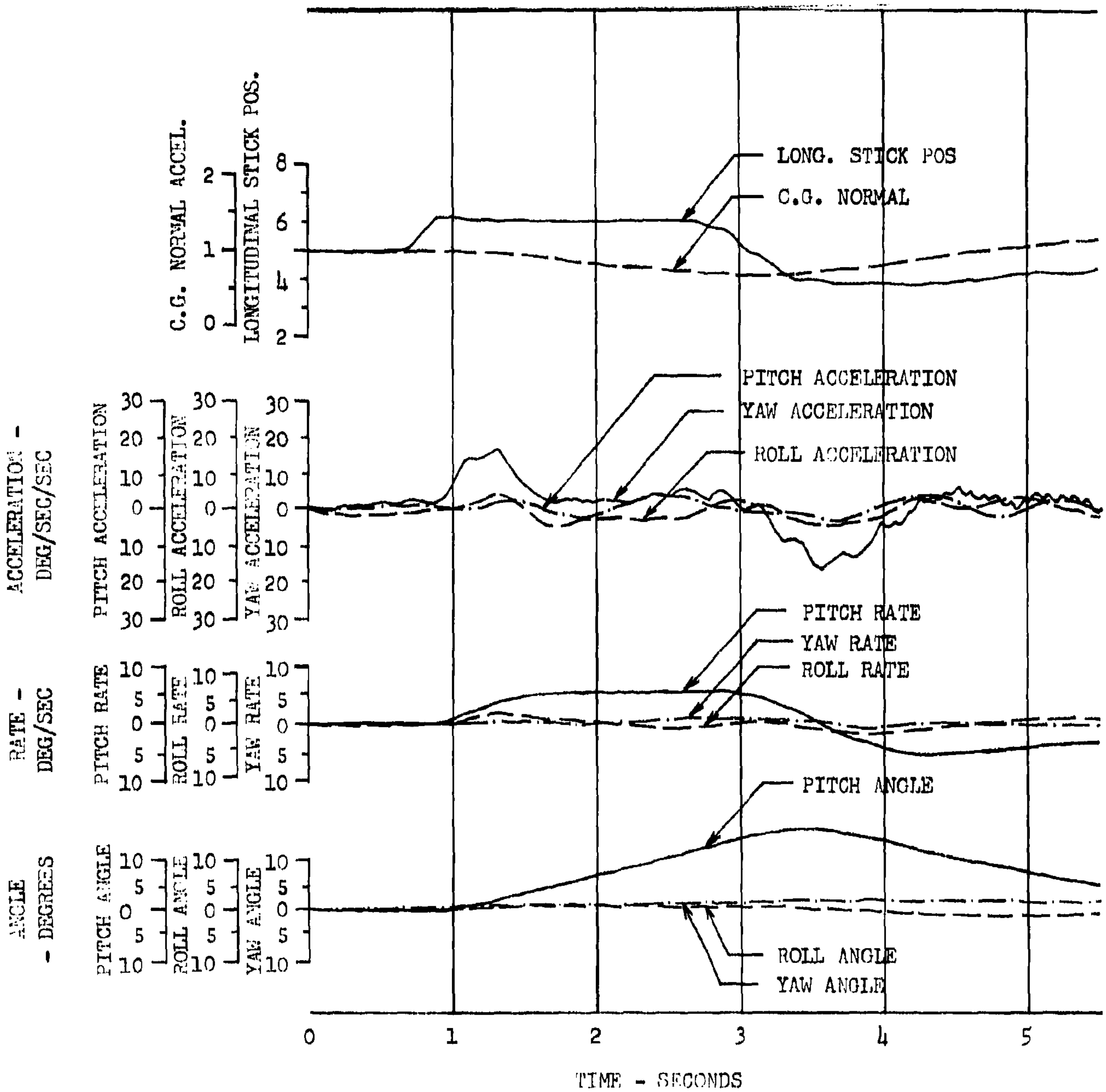


FIGURE NO. 193
TIME HISTORY OF LONGITUDINAL CONTROL STICK
MANEUVERING STABILITY
CH-47B U.S.A. S/N 66-19100

AVERAGE GROSS WEIGHT = 27350 LB.
AVERAGE C.G. = 330.8 IN. (MID)
AVERAGE DENSITY ALTITUDE = 5500 FT.

TRIM AIRSPEED = 138.0 KCAS
AVERAGE ROTOR SPEED = 230 R.P.M.
S.A.S. -ON

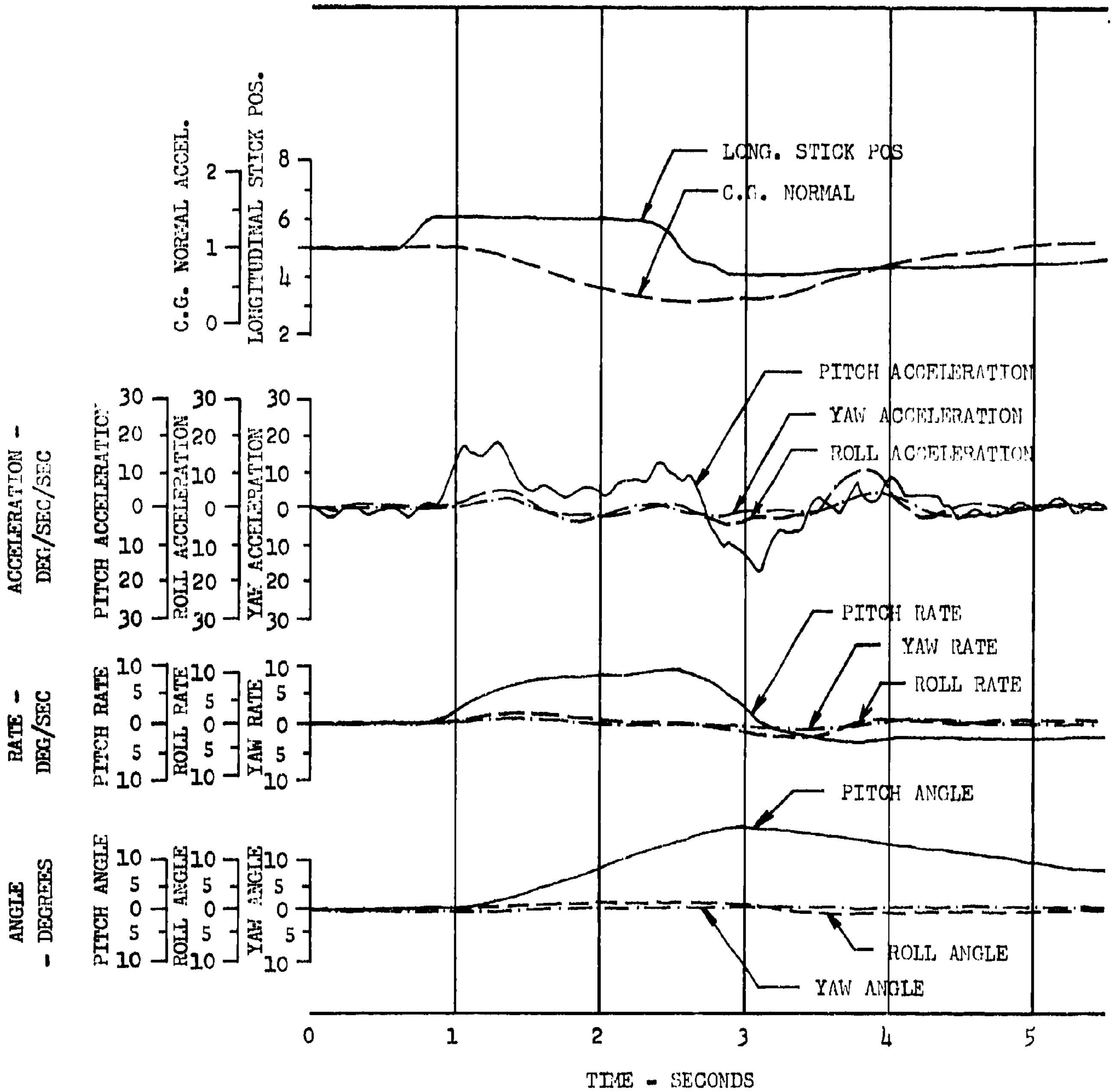


FIGURE NO. 194
TIME HISTORY OF LONGITUDINAL CONTROL STICK
MANEUVERING STABILITY
CH-47B U.S.A. S/N 66-19100

AVERAGE GROSS WEIGHT = 37520 LB.
AVERAGE C.G. = 314.2 (FWD)
AVERAGE DENSITY ALTITUDE = 10500 FT.
TRIM AIRSPEED = 77.0 KCAS
AVERAGE ROTOR SPEED = 230 R.P.M.
S.A.S. - ON

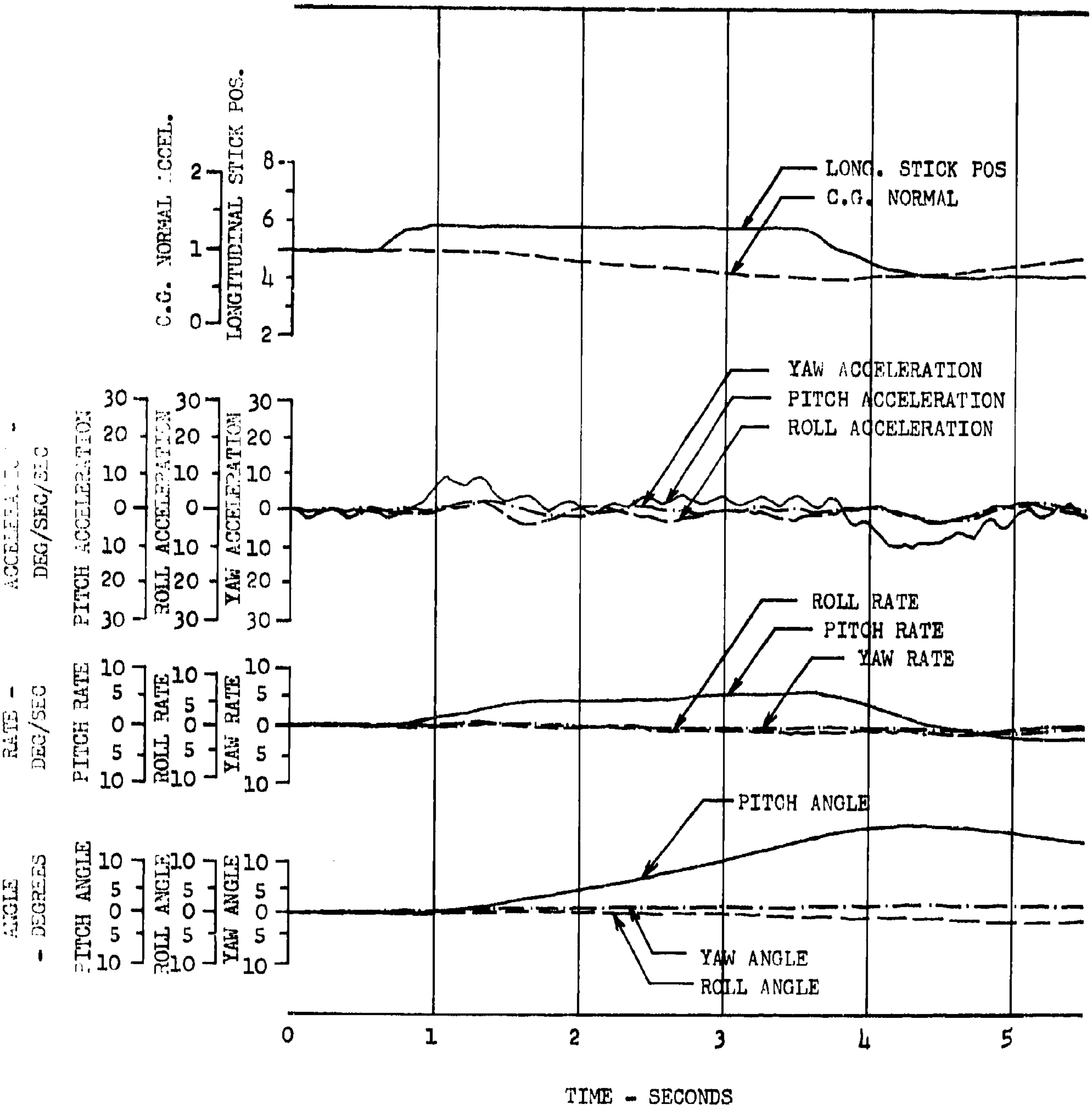


FIGURE NO. 195

TIME HISTORY OF LONGITUDINAL CONTROL STICK

MANEUVERING STABILITY

CH-47B U.S.A. S/N 66-19100

AVERAGE GROSS WEIGHT = 37000 LB.
AVERAGE C.G. = 331.0 (MID)
AVERAGE DENSITY ALTITUDE = 5160 FT.

TRIM AIRSPEED = 100.0 KCAS
AVERAGE ROTOR SPEED = 230 R.P.M.
S.A.S. = ON

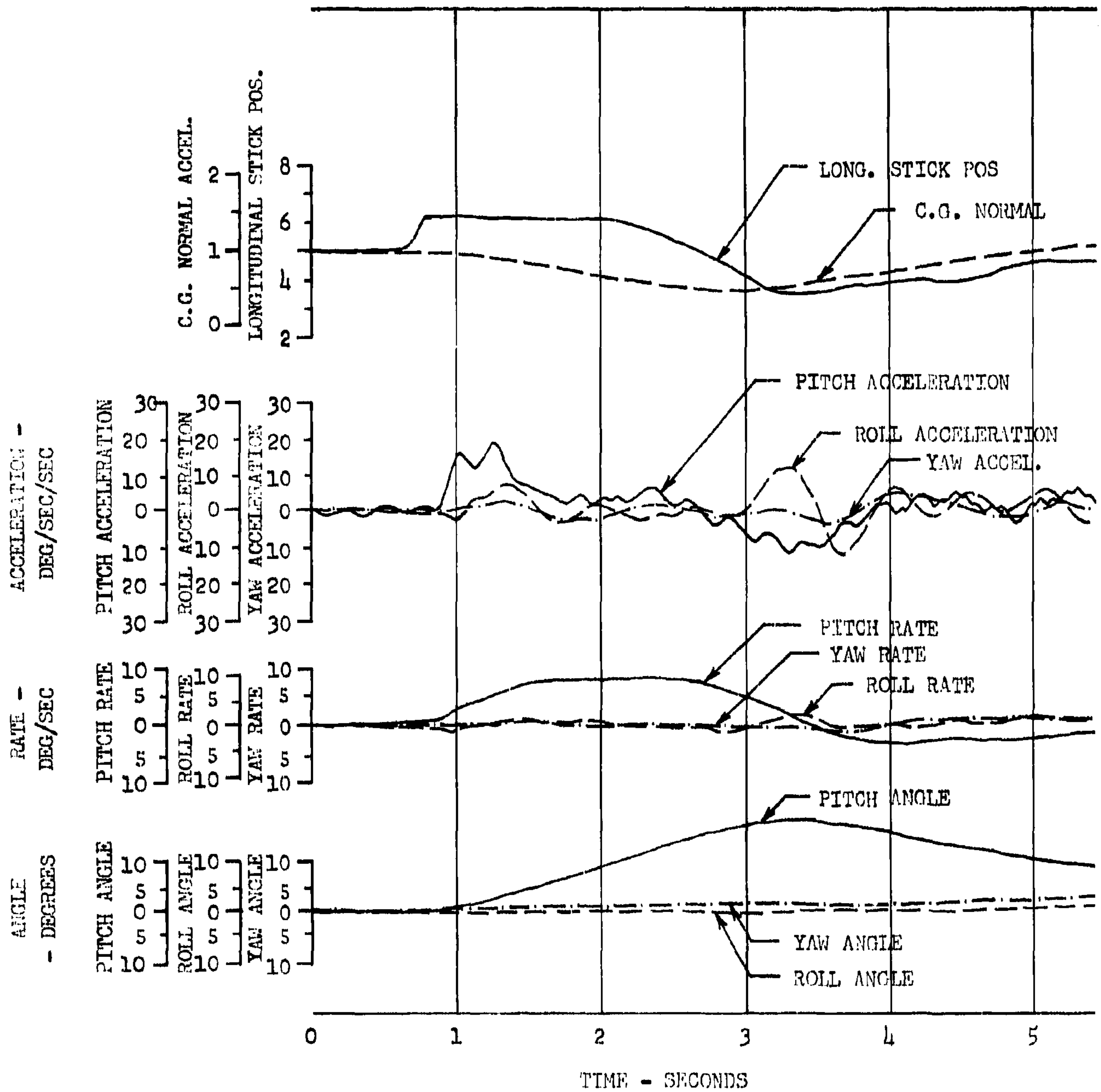
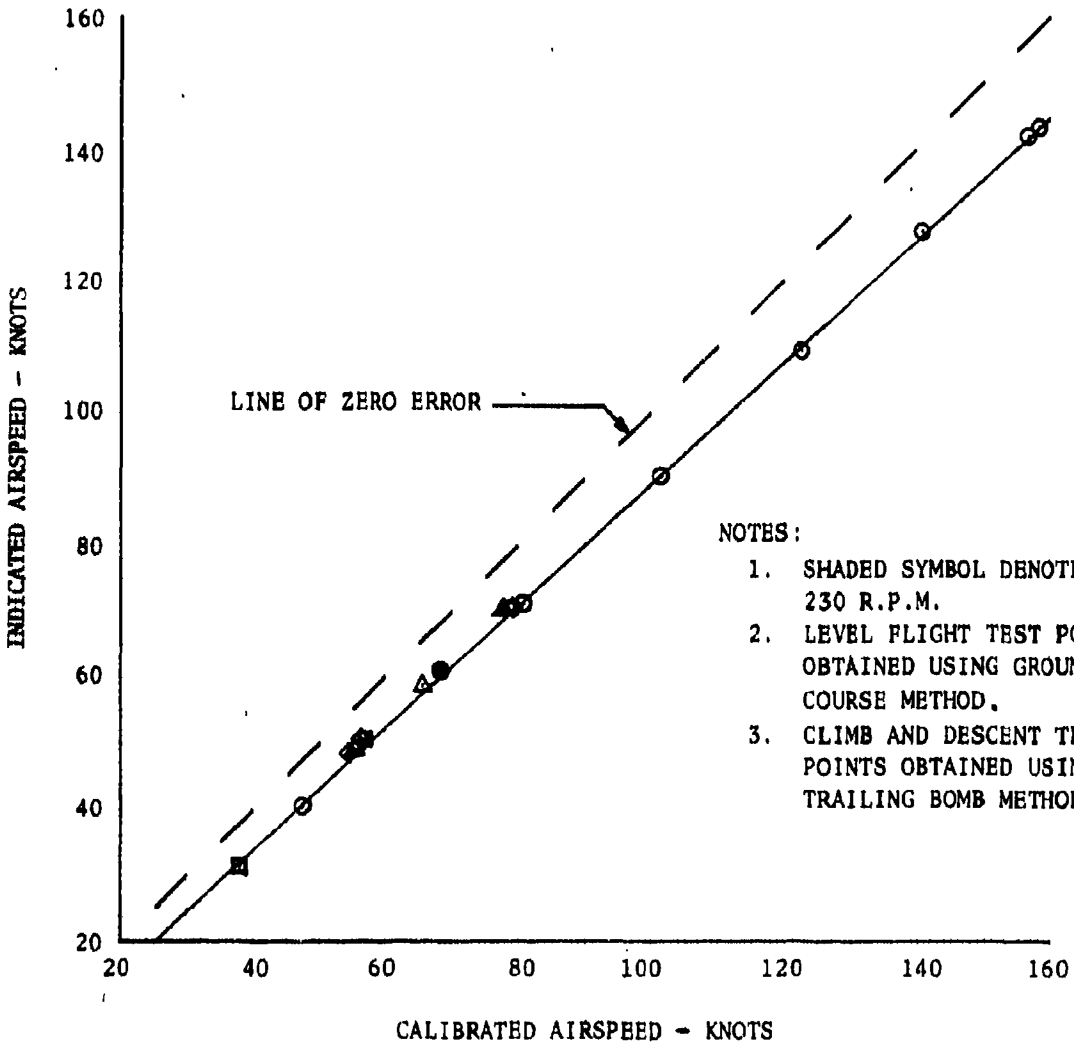


FIGURE NO. 196
AIRSPEED CALIBRATION
CH-47B U.S.A. S/N 66-19100

TEST (BOOM) AIRSPEED SYSTEM

SYM.	FLIGHT CONDITION	AVG. DENSITY ALTITUDE FT.	AVG. CROSS WEIGHT LB.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
⊙	LEVEL FLIGHT	1610	26080	332.3(MID)	225
⊡	LEVEL FLIGHT	2660	33560	330.8(MID)	225
△	CLIMB	6230	33560	330.8(MID)	225
◇	DESCENT	5750	33560	330.8(MID)	225



NOTES:

1. SHADED SYMBOL DENOTES 230 R.P.M.
2. LEVEL FLIGHT TEST POINTS OBTAINED USING GROUND SPEED COURSE METHOD.
3. CLIMB AND DESCENT TEST POINTS OBTAINED USING TRAILING BOMB METHOD.

FIGURE NO. 197
AIRSPEED CALIBRATION
CH-47B U.S.A. S/N 66-19100

STANDARD (SHIP'S) AIRSPEED SYSTEM
IN LEVEL FLIGHT

SYM.	AVG. DENSITY ALTITUDE FT.	AVG. GROSS WEIGHT LB.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
⊙	1610	26080	332.3(MID)	225
⊡	2660	33560	330.8(MID)	225

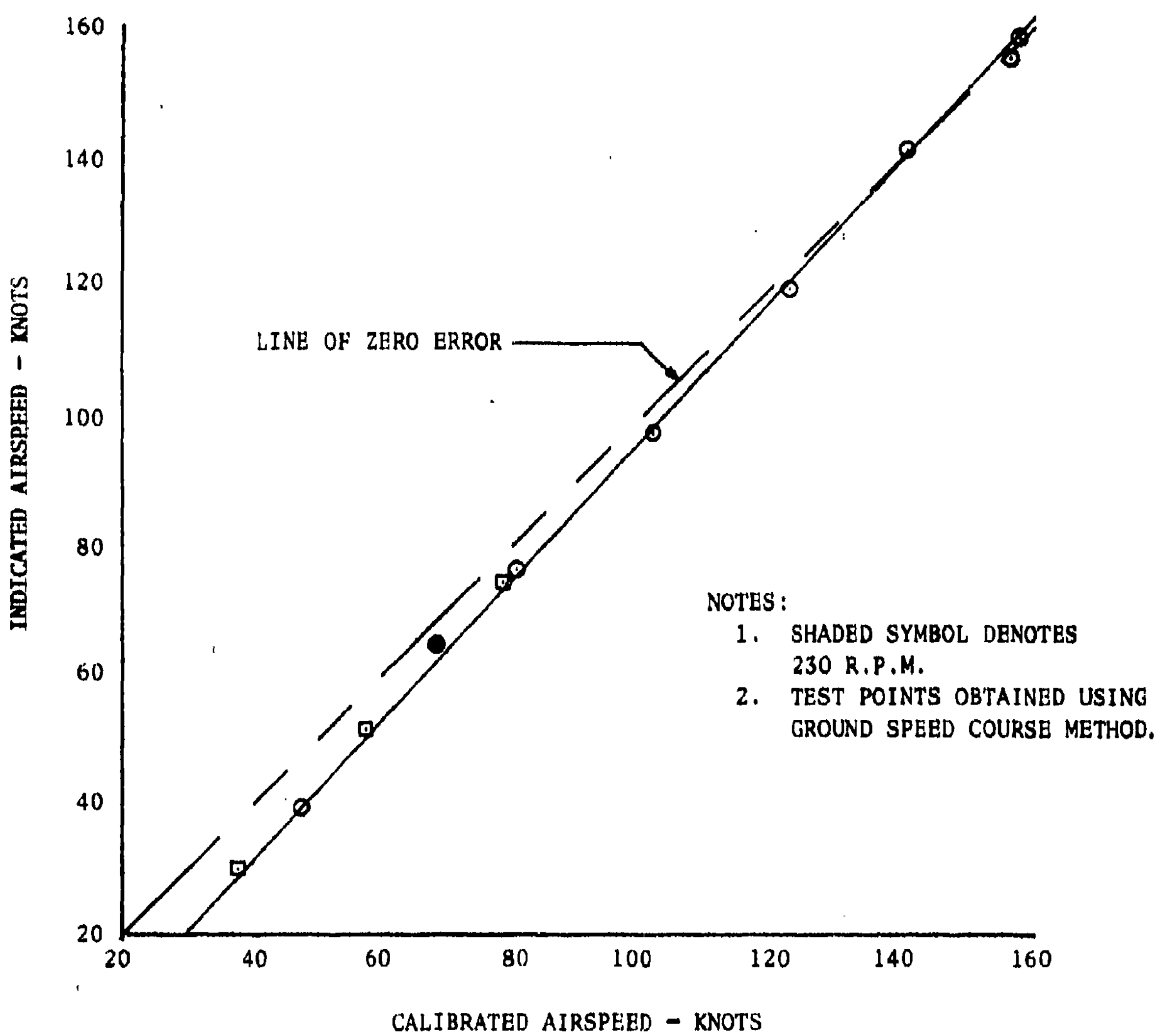


FIGURE NO. 198
AIRSPEED CALIBRATION
CH-47B U.S.A. S/N 66-19100

STANDARD (SHIP'S) AIRSPEED SYSTEM
IN CLIMB AND AUTOROTATION

NOTES:

1. MAXIMUM RATE OF CLIMB OBTAINED = 2170 FT/MIN.
2. MAXIMUM RATE OF DESCENT OBTAINED = 2640 FT/MIN.
3. BOOM AIRSPEED SYSTEM ASSUMED STANDARD.

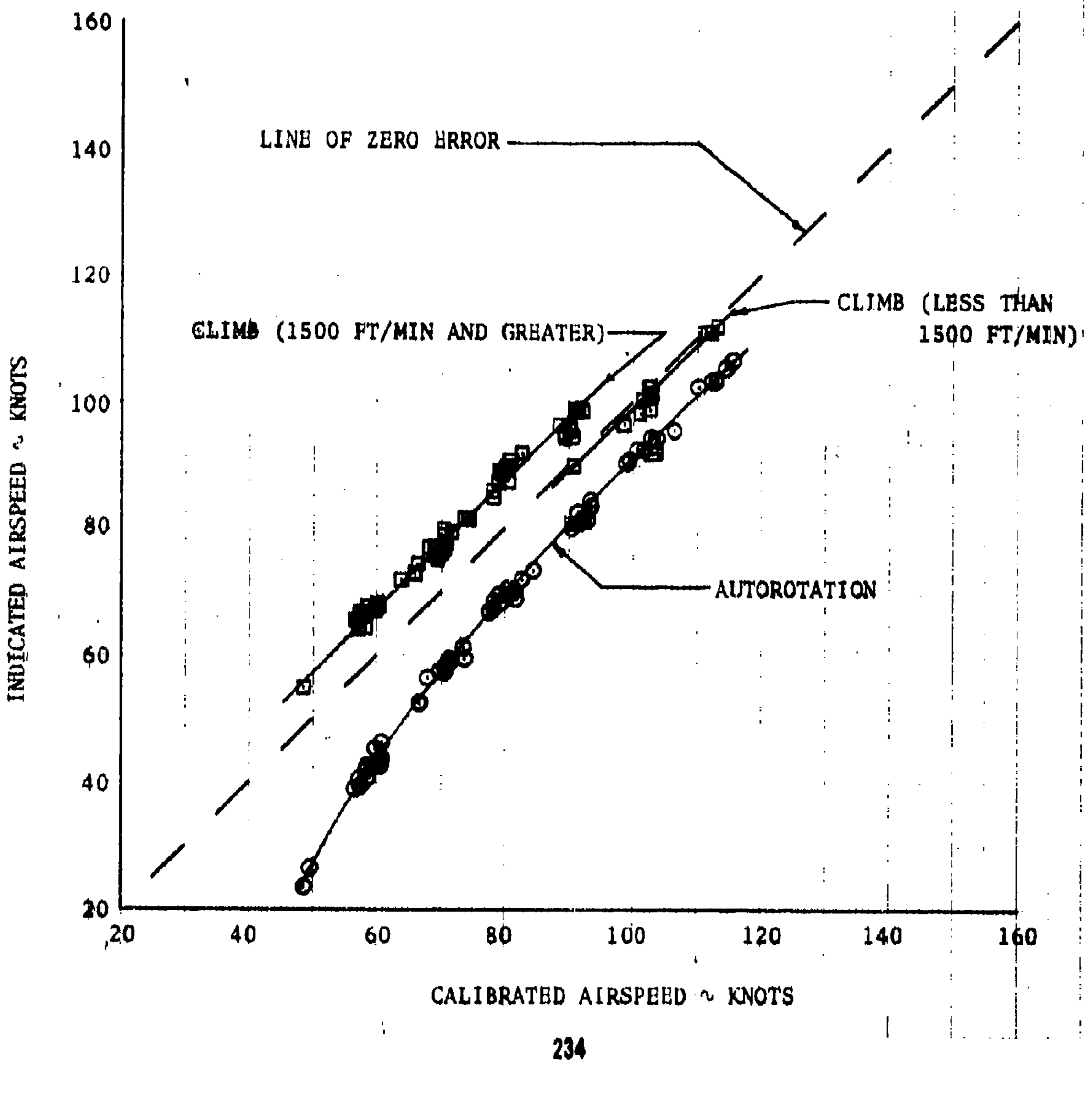


FIGURE NO. 199
SHIP SYSTEM POSITION ERROR
CORRECTION IN SIDESLIP
CH-47B U.S.A. S/N 66-19100

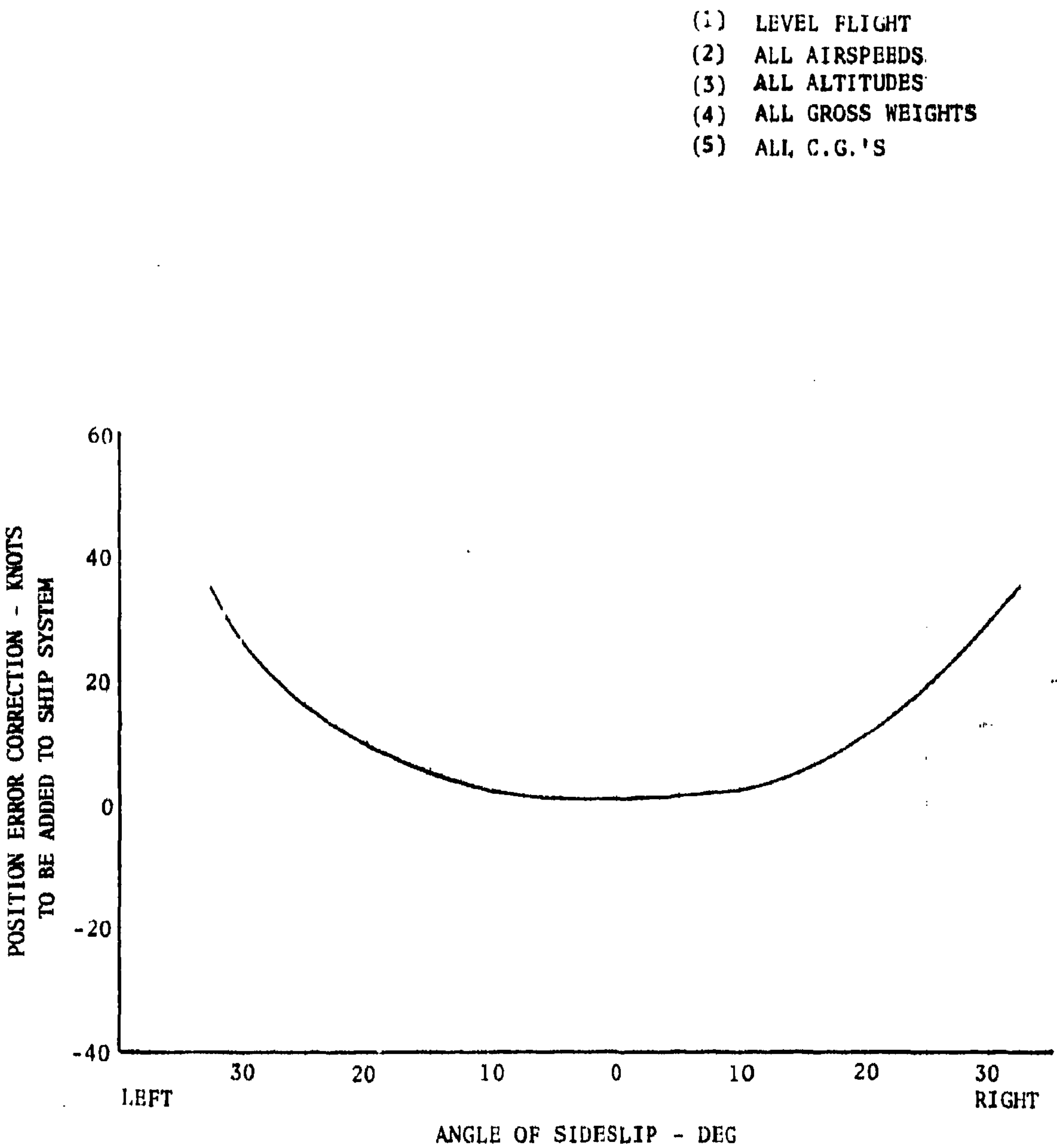


FIGURE NO. 200
AIRSPEED CALIBRATION IN SIDESLIP
CH-47B U.S.A. S/N 66-19100
STANDARD (SHIP'S) AIRSPEED SYSTEM
IN LEVEL FLIGHT

NOTE:
1. BOOM AIRSPEED SYSTEM ASSUMED STANDARD.

SYM.	INDICATED AIRSPEED KT.	DENSITY ALTITUDE FT.	C.G. IN.	ROTOR SPEED R.P.M.	GROSS WEIGHT LB.
○	60	5000	330.4(MID)	230	28500
□	60	3000	330.5(MID)	230	38500
△	60	3000	335.4(AFT)	230	38500
◁	60	3000	313.8(FWD)	230	38500
◇	60	9000	330.4(MID)	230	28500
▽	90	9000	330.4(MID)	230	28500
○	100	5000	330.4(MID)	230	28500
✪	100	3000	330.5(MID)	230	38500
⬠	100	3000	335.4(AFT)	230	38500
○	100	3000	313.8(FWD)	230	28500
▽	120	3000	330.4(MID)	230	38500
◇	120	3000	335.4(AFT)	230	38500
△	120	3000	313.8(FWD)	230	28500
□	120	9000	330.4(MID)	230	28500
○	130	5000	330.4(MID)	230	28500

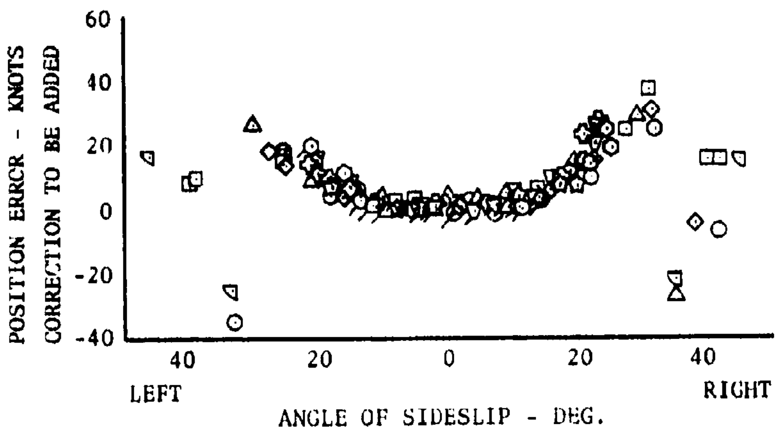


FIGURE NO. 201
AIRSPEED CALIBRATION IN SIDESLIP
CH-47B USA S/N 66-19100

NOTE: BOOM AIRSPEED SYSTEM ASSUMED STANDARD.

SYM	BOOM CALIBRATED AIRSPEED KT.	DENSITY ALTITUDE FT.	C.G. IN.	ROTOR SPEED RPM	GROSS WEIGHT LB.
○	60	5000	330.4 (MID)	230	28500
□	60	3000	330.5 (MID)	230	38500
△	60	3000	335.4 (AFT)	230	38500
◁	60	3000	313.8 (FWD)	230	38500
◇	60	9000	330.4 (MID)	230	28500
▽	90	9000	330.4 (MID)	230	28500

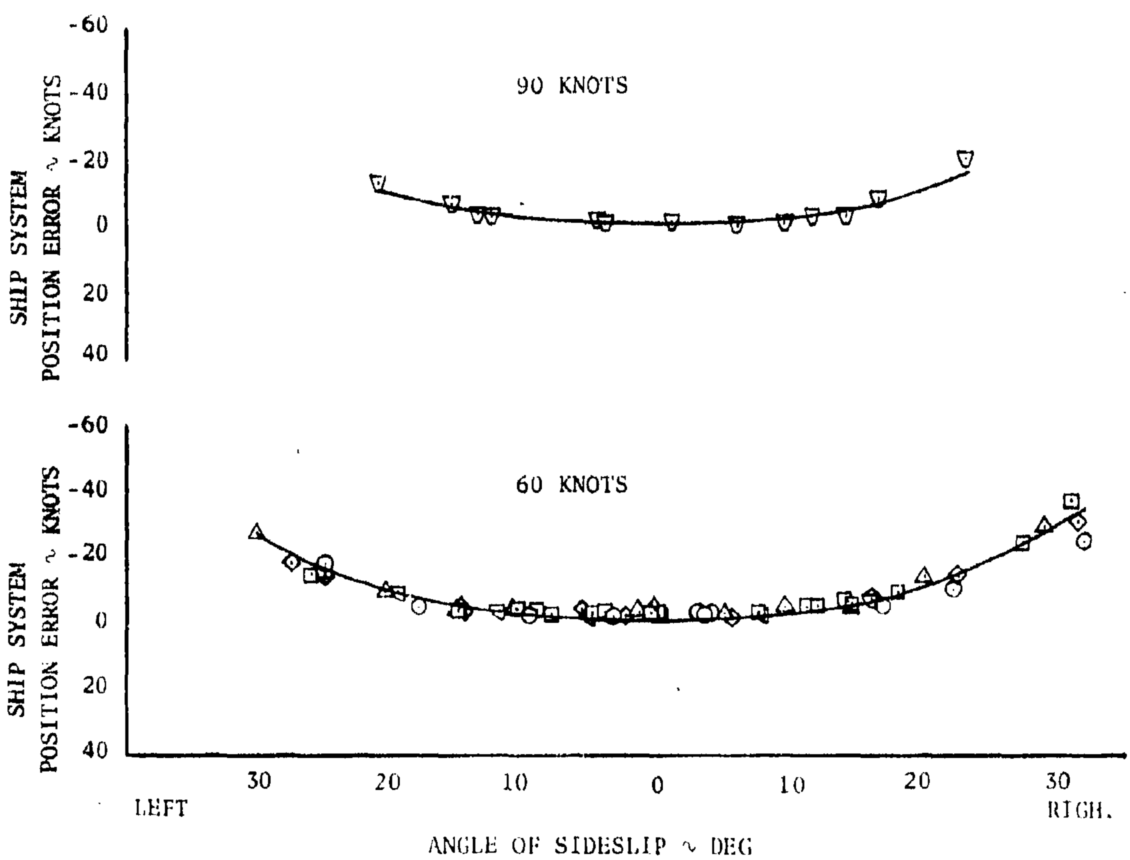


FIGURE NO. 202
AIRSPEED CALIBRATION IN SIDESLIP
CH-47B USA S/N 66-19100

NOTE: BOOM AIRSPEED SYSTEM ASSUMED STANDARD.

SYM	BOOM CALIBRATED AIRSPEED KT.	DENSITY ALTITUDE FT.	C.G. IN.	ROTOR SPEED RPM	GROSS WEIGHT LB.
○	100	5000	330.4 (MID)	230	28500
□	100	3000	330.5 (MID)	230	38500
△	100	3000	335.4 (AFT)	230	38500
◁	100	3000	313.8 (FWD)	230	28500
◇	115	3000	330.4 (MID)	230	38500
▽	115	9000	330.4 (MID)	230	28500

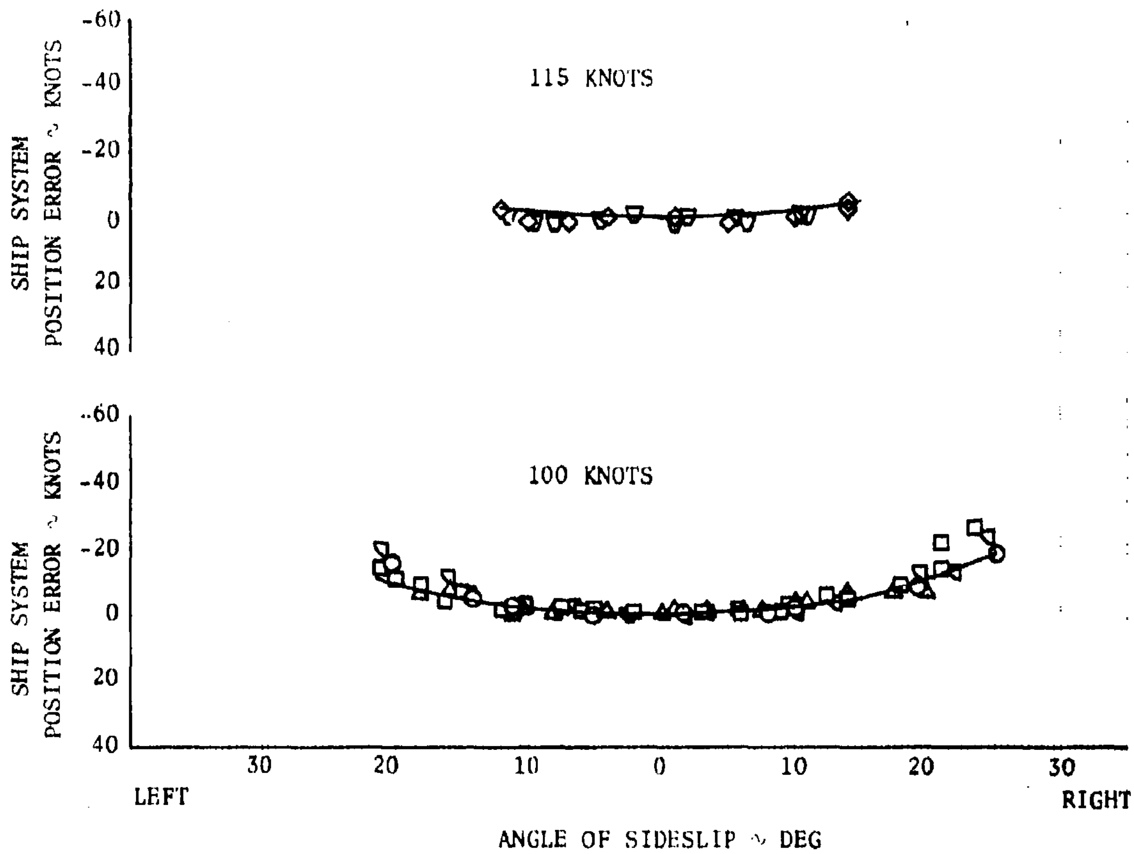


FIGURE NO. 203
AIRSPEED CALIBRATION IN SIDESLIP
CH-47B USA S/N 66-19100

NOTE: BOOM AIRSPEED SYSTEM ASSUMED STANDARD.

SYM	BOOM CALIBRATED AIRSPEED KT.	DENSITY ALTITUDE FT.	C.G. IN.	ROTOR SPEED RPM	GROSS WEIGHT LB.
○	120	3000	330.4 (MID)	230	38500
□	120	3000	335.4 (AFT)	230	38500
△	120	3000	313.8 (FWD)	230	28500
◁	130	5000	330.4 (MID)	230	28500

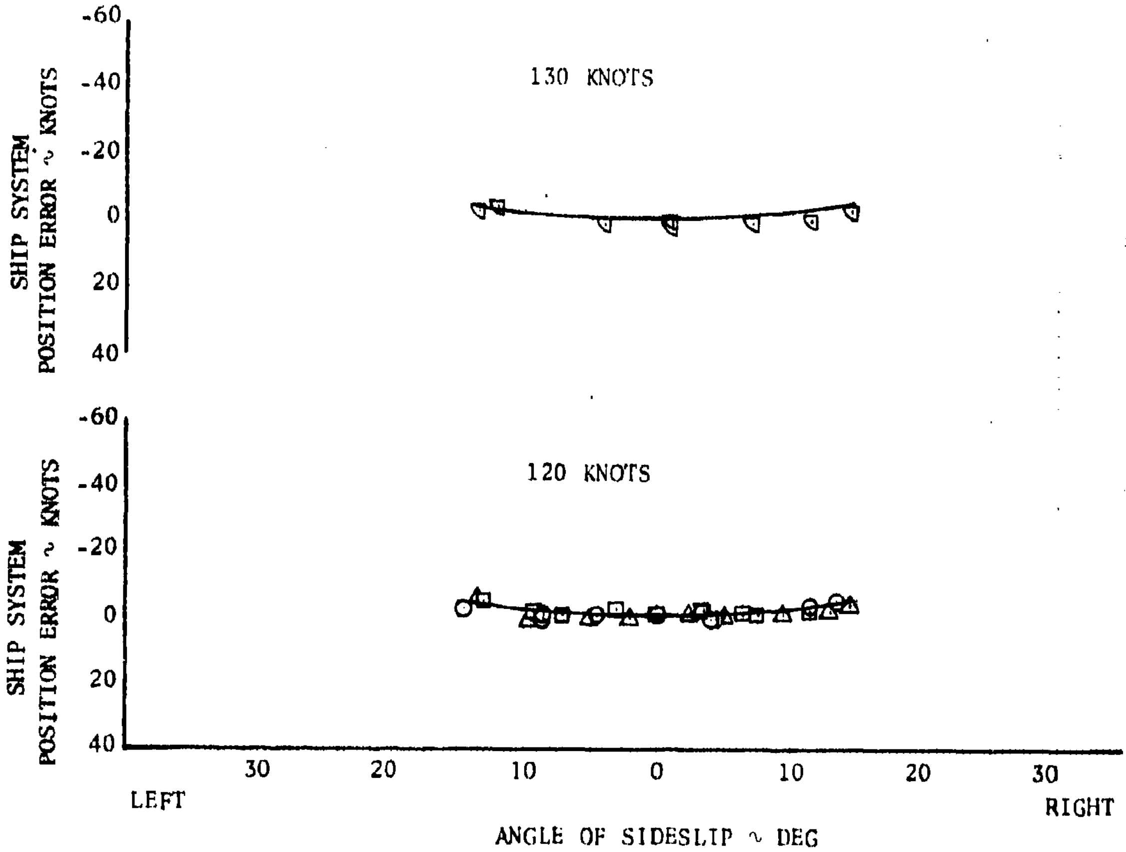


FIGURE NO. 204
AIRSPEED CALIBRATION IN SIDESLIP
CH-47B U.S.A. S/N 66-19100
STANDARD (SHIP'S) AIRSPEED SYSTEM
IN CLIMB AND AUTOROTATION

NOTE:

1. BOOM AIRSPEED SYSTEM ASSUMED STANDARD.

SYM.	INDICATED AIRSPEED KT.	DENSITY ALTITUDE FT.	C.G. IN.	ROTOR SPEED R.P.M.	GROSS WEIGHT LB.
0	60	5000	330.4(MID)	230	28500
○	80	9000	330.4(MID)	225	28500
□	80	5000	330.4(MID)	225	28500
△	80	9000	330.4(MID)	230	28500
☆	80	3000	330.5(MID)	230	38500
▽	80	3000	313.8(FWD)	230	38500
◇	100	5000	330.4(MID)	230	28500
◁	110	5000	330.4(MID)	225	28500

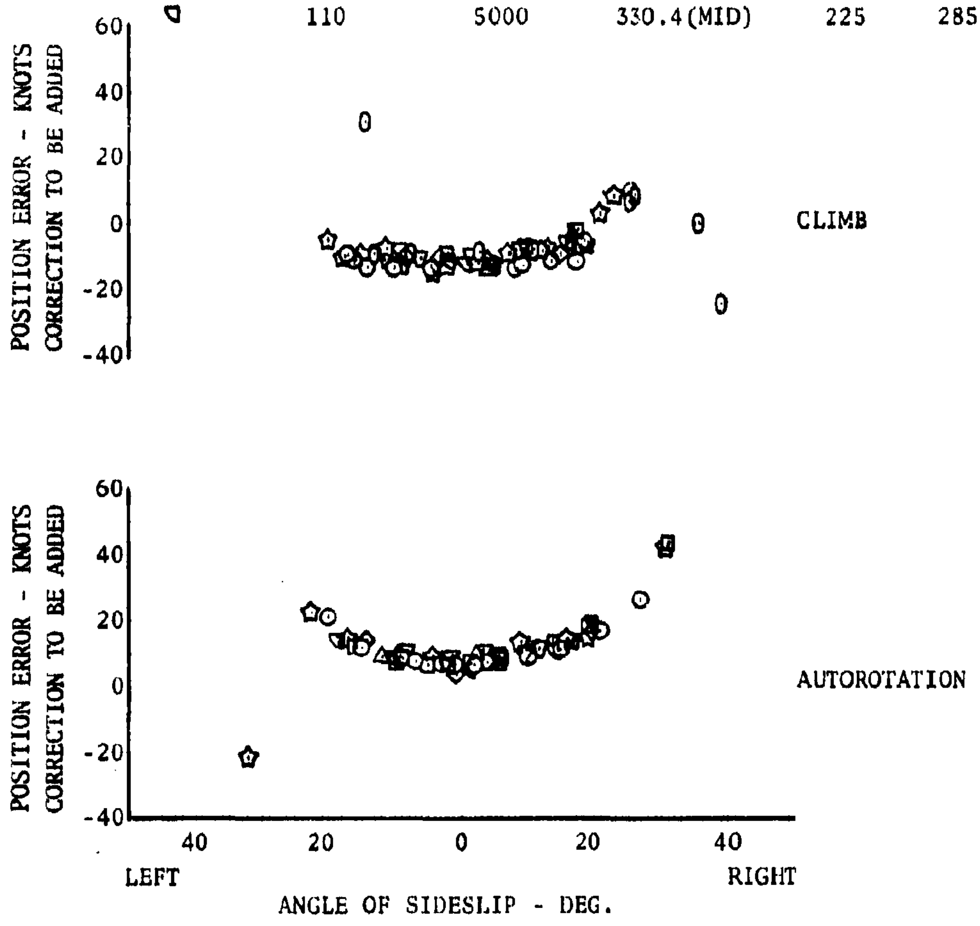


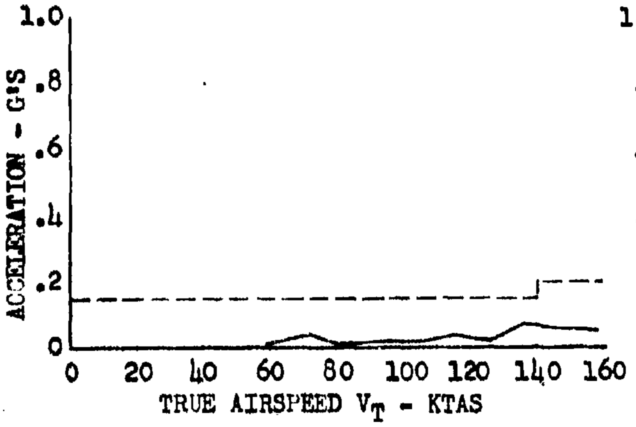
FIGURE NO. 205
1/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

AVG. GROSS WT. = 27000 LB.	AVG. GROSS WT. = 40000 LB.
AVG. C.G. = 331.5 (MID)	AVG. C.G. = 330.2 (MID)
AVG. DENSITY ALT. = 1300 FT.	AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 230 R.P.M.	AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON	S.A.S. CONFIG. - ON

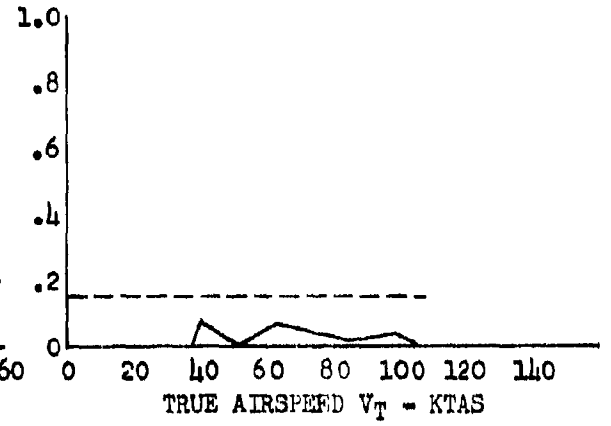
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

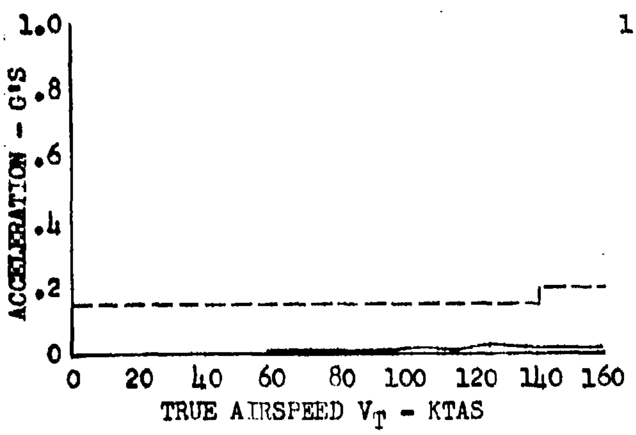
STATION 50 VERTICAL



STATION 50 VERTICAL



STATION 50 LATERAL



STATION 50 LATERAL

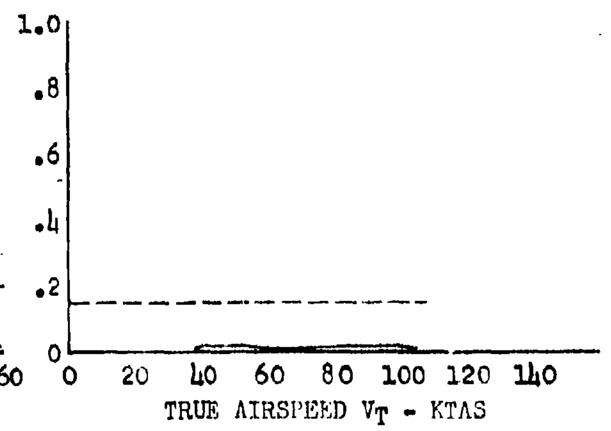


FIGURE NO. 206
1/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

AVG. GROSS WT. = 37,000 LB.	AVG. GROSS WT. = 40,000 LB.
AVG. C.G. = 331.9 (MID)	AVG. C.G. = 330.2 (MID)
AVG. DENSITY ALT. = 5000 FT.	AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.	AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON	S.A.S. CONFIG. - ON

SPEED TRIM (D.C.P. & LONG CYCLIC) = AUTO

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

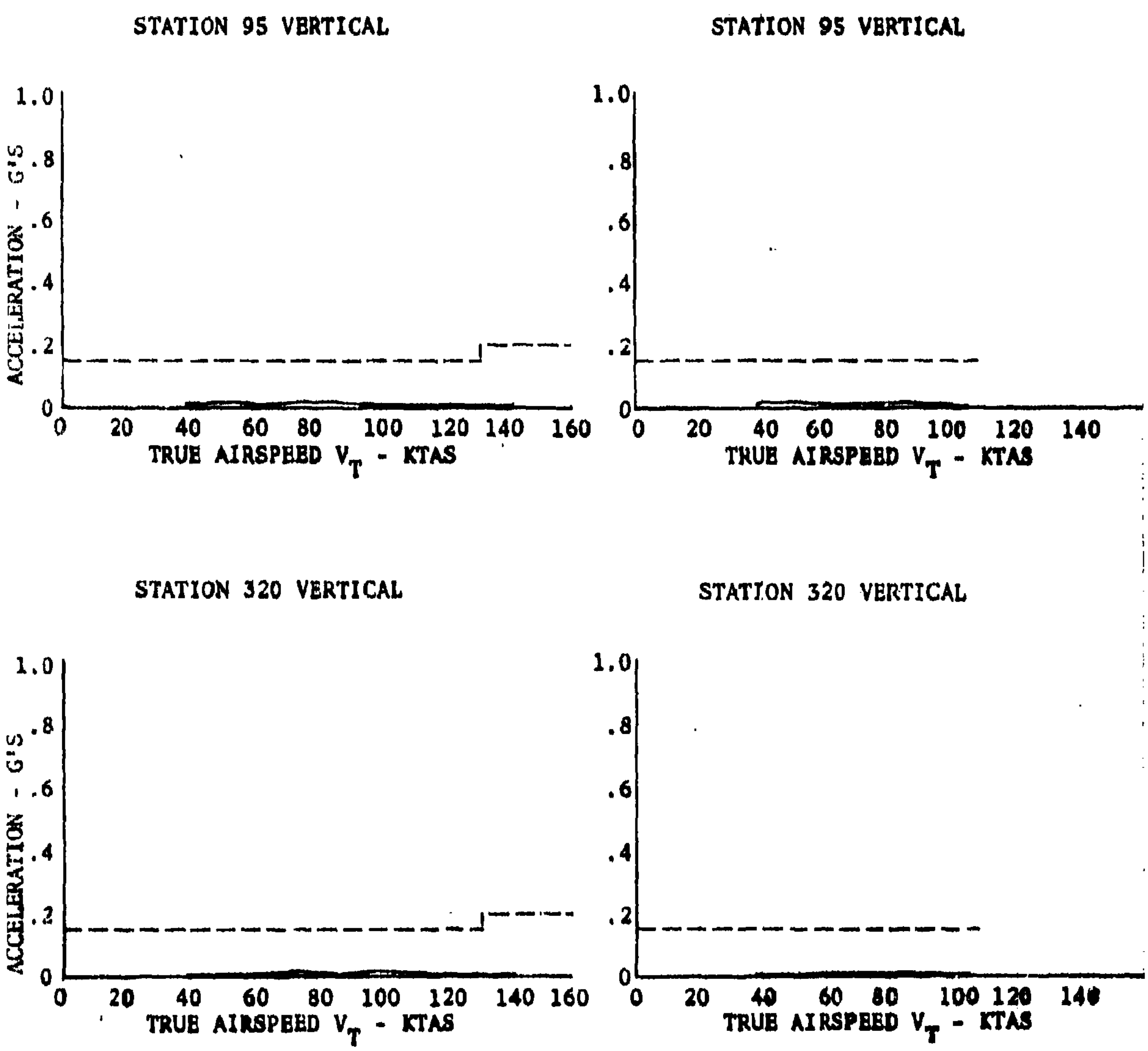


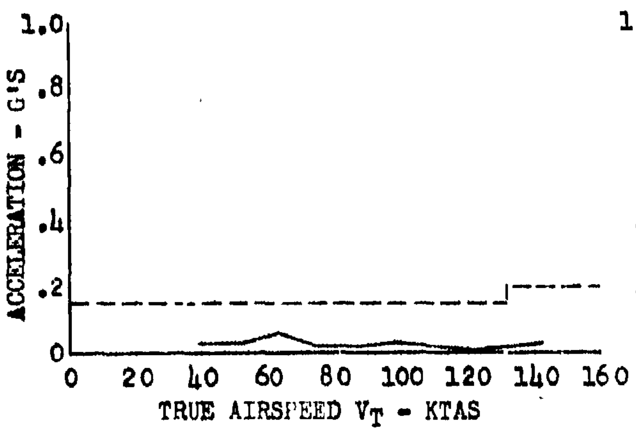
FIGURE NO. 207
1/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

AVG. GROSS WT. = 37000 LB.	AVG. GROSS WT. = 40000 LB.
AVG. C.G. = 331.9 (MID)	AVG. C.G. = 330.2 (MID)
AVG. DENSITY ALT. = 5000 FT.	AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.	AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON	S.A.S. CONFIG. - ON

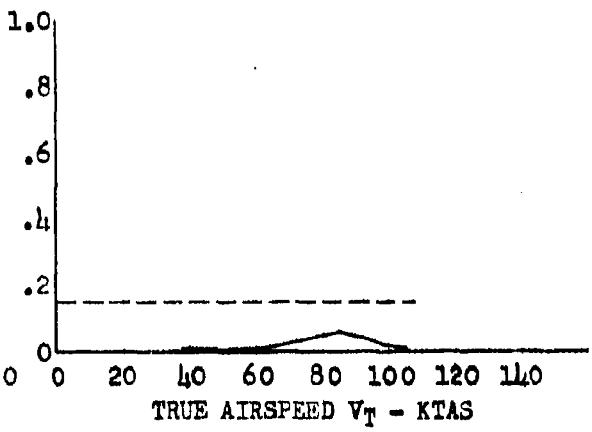
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

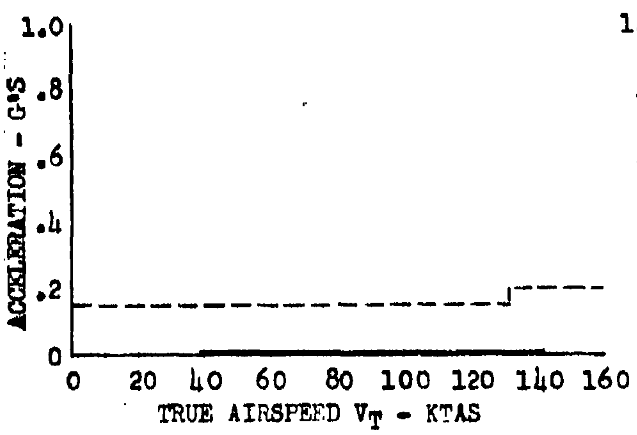
STATION 95 LATERAL



STATION 95 LATERAL



STATION 320 LATERAL



STATION 320 LATERAL

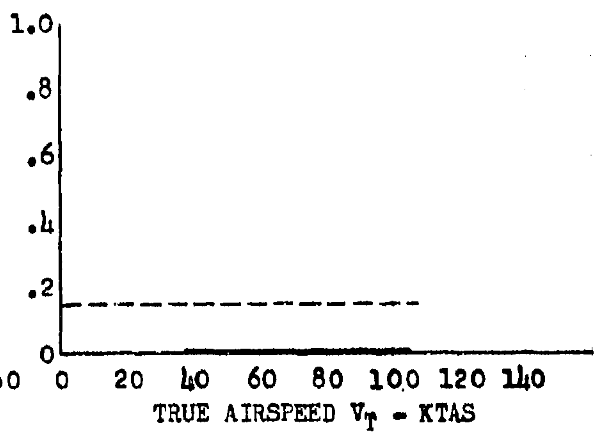


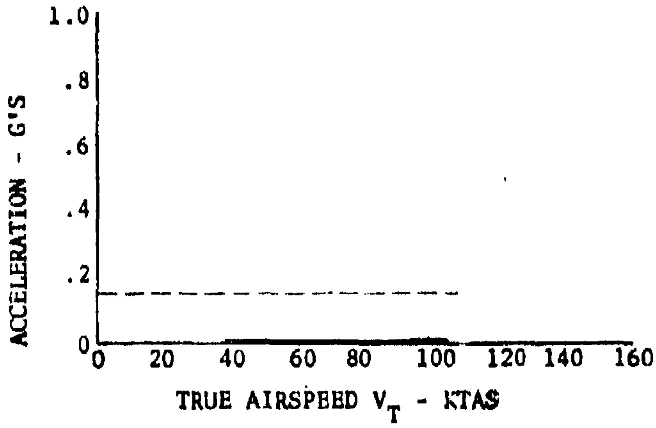
FIGURE NO. 208
1 /REV VIBRATION CHARACTERISTICS
CH- 47B U.S.A. S/N 66-19100
LEVEL FLIGHT

AVG. GROSS WT. = 40,000 LB.
AVG. C.G. = 330.2 (MID)
AVG. DENSITY ALT. = 5000 FT.

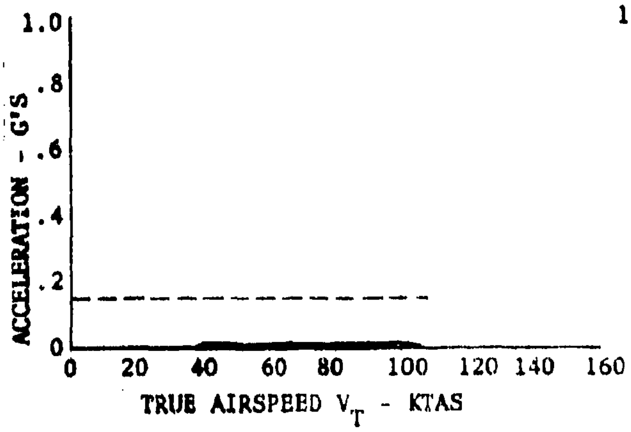
AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON
SPEED TRIM (D.C.P. & LONG CYCLIC) = AUTO

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

STATION 480 VERTICAL



STATION 480 LATERAL



STATION 120 LATERAL

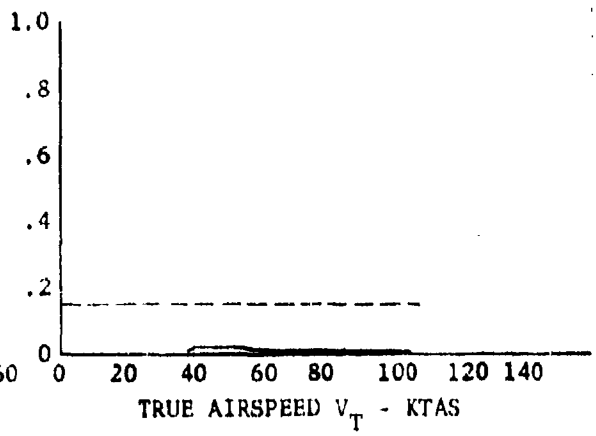


FIGURE NO. 209
3/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

AVG. GROSS WT. = 37,000 LB.	AVG. GROSS WT. = 40,000 LB.
AVG. C.G. = 331.9 (MID)	AVG. C.G. = 330.2 (MID)
AVG. DENSITY ALT. = 5000 FT.	AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.	AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON	S.A.S. CONFIG. - ON

SPEED TRIM (D.C.P. & LONG CYCLIC) = AUTO

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

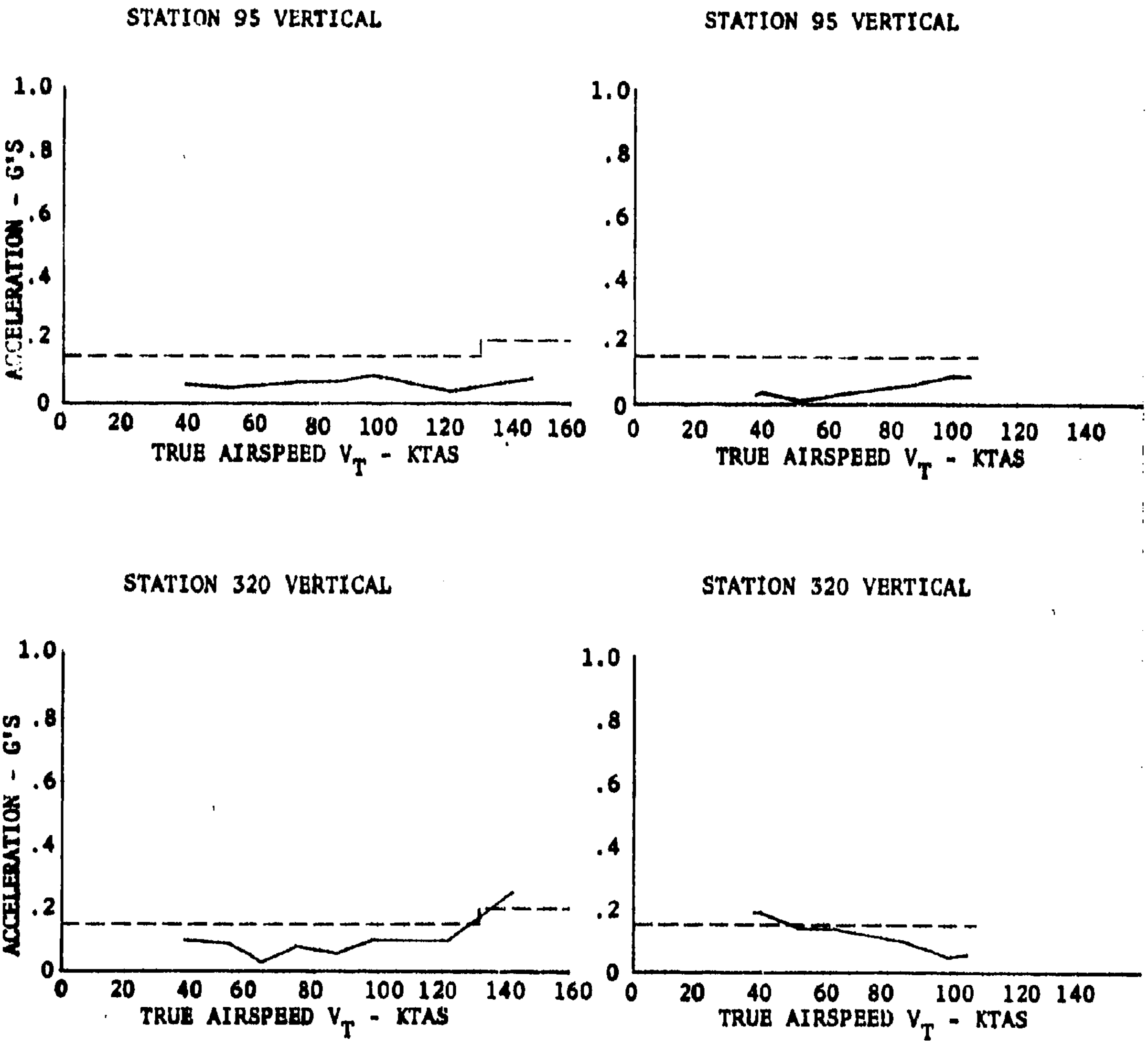


FIGURE NO. 210
3/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

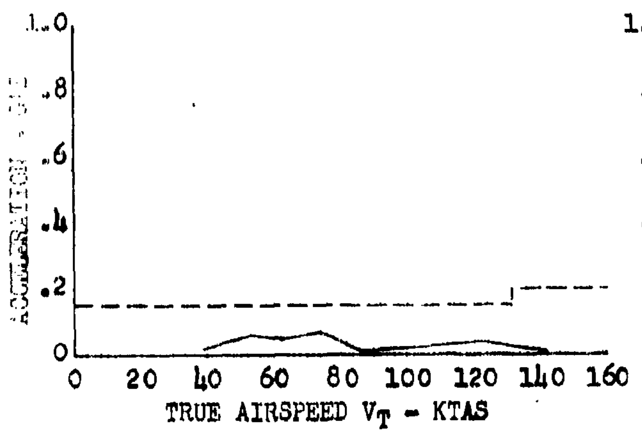
AVG. GROSS WT. = 37000 LB.
AVG. C.G. = 331.9 (MID)
AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.
S.A.S. CONFIG. - ON

AVG. GROSS WT. = 40000 LB.
AVG. C.G. = 330.2 (MID)
AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON

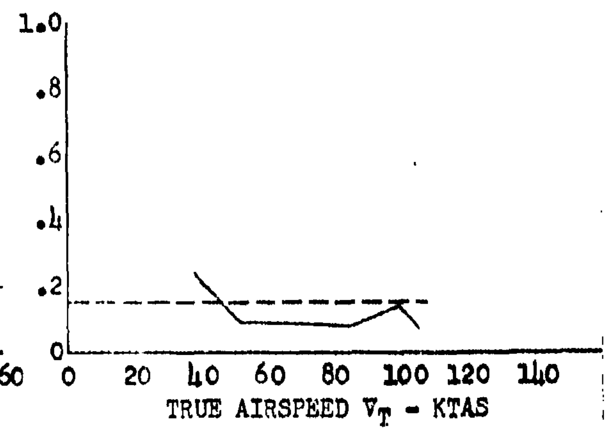
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

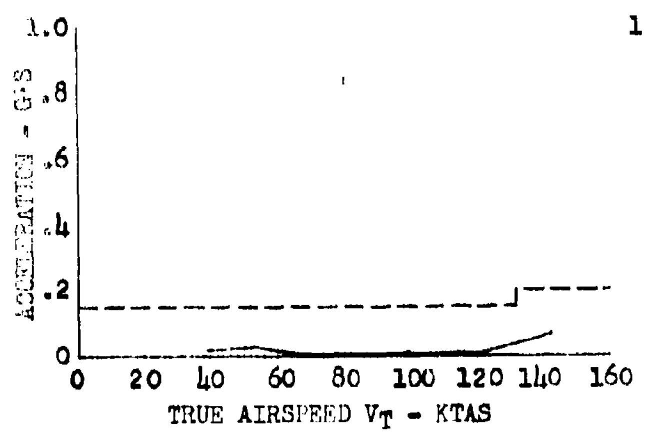
STATION 95 LATERAL



STATION 95 LATERAL



STATION 320 LATERAL



STATION 320 LATERAL

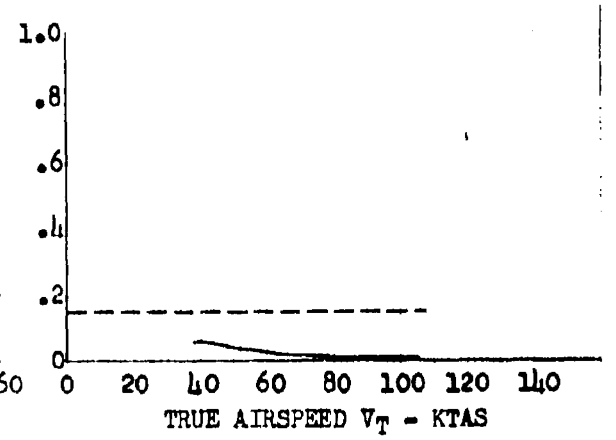
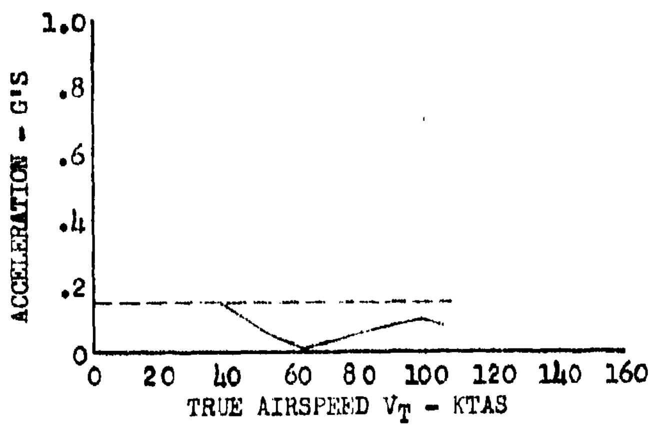


FIGURE NO. 211
3/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

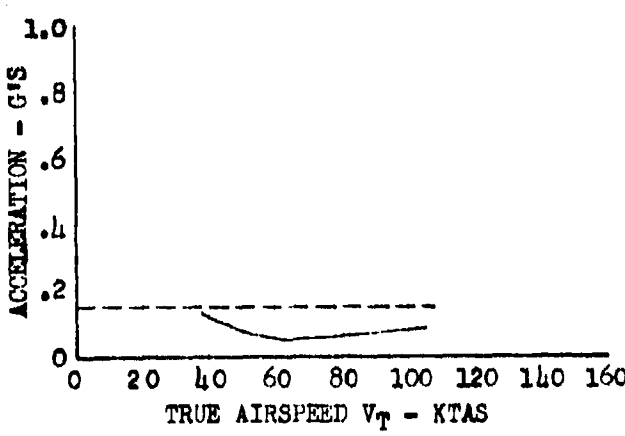
AVG. GROSS WT. = 40000 LB. AVG. ROTOR SPEED = 230 R.P.M.
AVG. C.G. = 330.2 (MID) S.A.S. CONFIG. - ON
AVG. DENSITY ALT. = 5000 FT. SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

STATION 480 VERTICAL



STATION 480 LATERAL



STATION 120 LATERAL

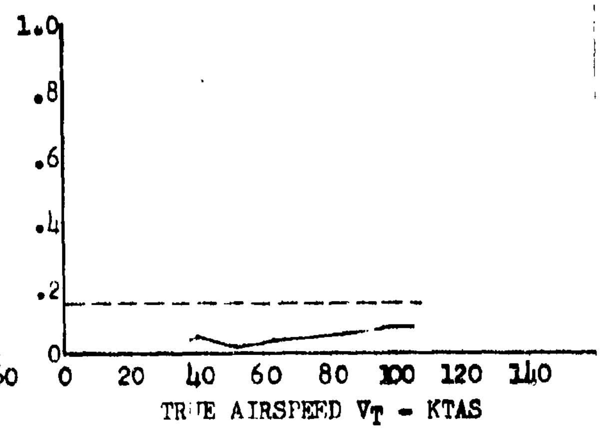


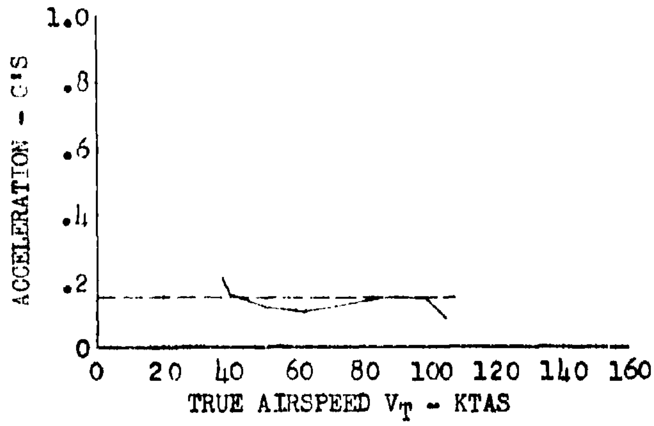
FIGURE NO. 212
6/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

AVG. GROSS WT. = 40000 LB.
AVG. C.G. = 330.2 (MID)
AVG. DENSITY ALT. = 5000 FT.

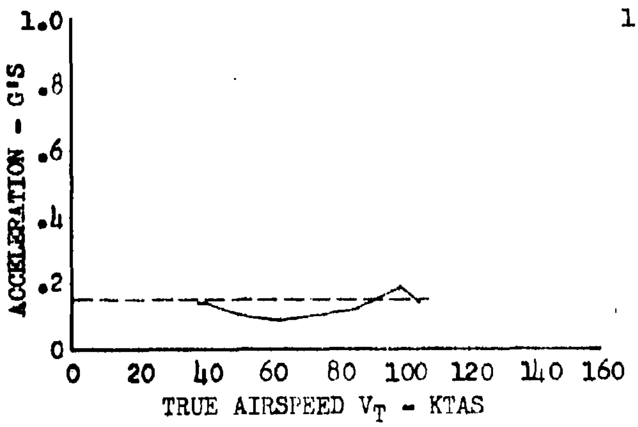
AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

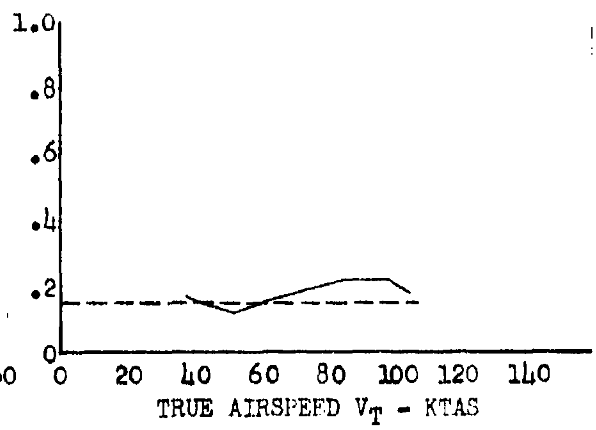
STATION 480 VERTICAL



STATION 480 LATERAL



STATION 120 LATERAL



5

FIGURE NO. 213

3/REV VIBRATION CHARACTERISTICS

CH-47B U.S.A. S/N 66-19100

LEVEL FLIGHT

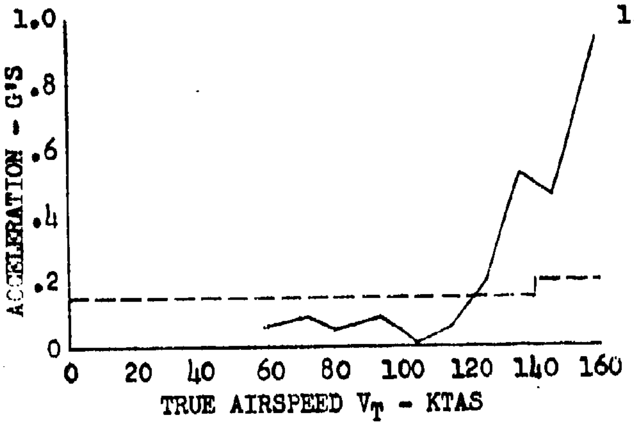
AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 331.5 (MID)
AVG. DENSITY ALT. = 1300 FT.
AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON

AVG. GROSS WT. = 40000 LB.
AVG. C.G. = 330.2 (MID)
AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON

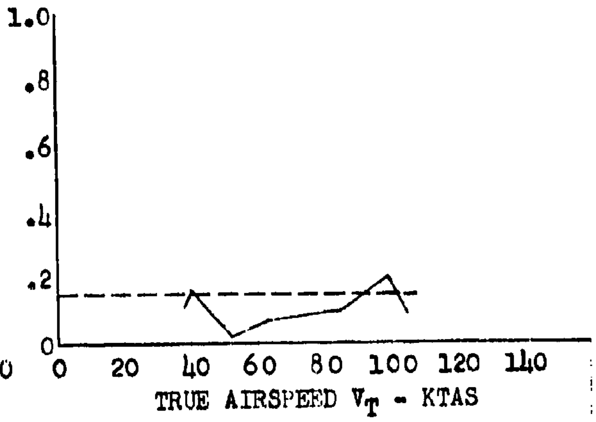
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

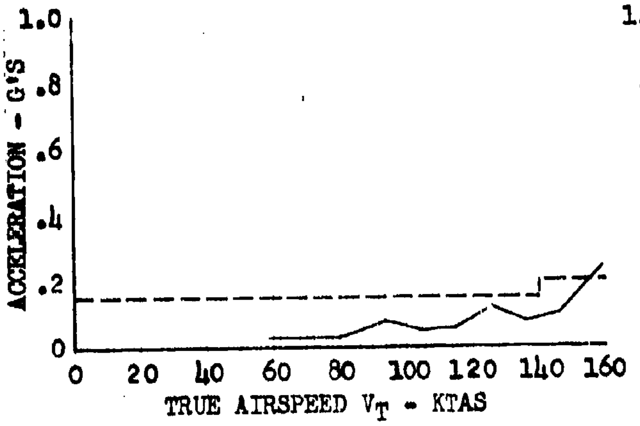
STATION 50 VERTICAL



STATION 50 VERTICAL



STATION 50 LATERAL



STATION 50 LATERAL

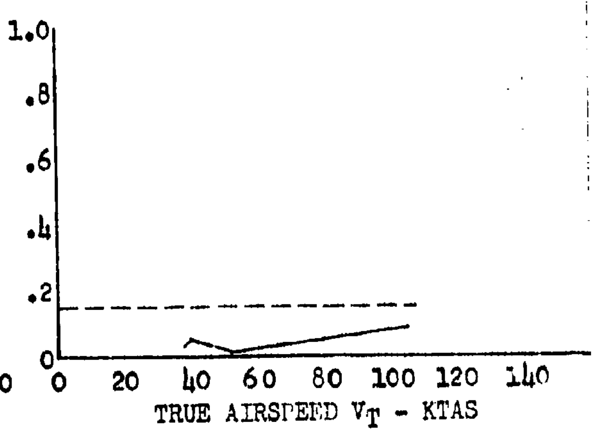


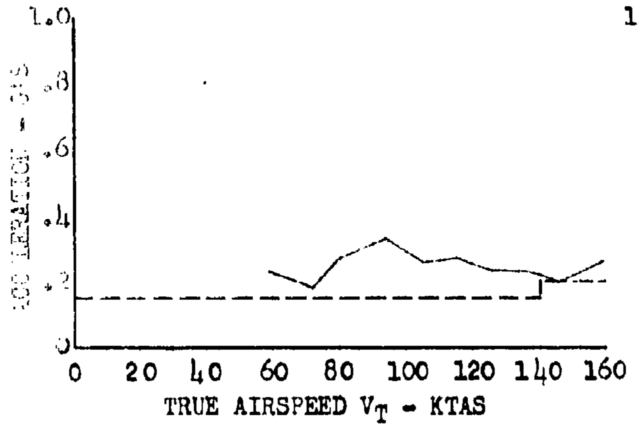
FIGURE NO. [illegible]
6/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

AVG. GROSS WT. = 27000 LB.	AVG. GROSS WT. = 40000 LB.
AVG. C.G. = 331.5 (MID)	AVG. C.G. = 330.2 (MID)
AVG. DENSITY ALT. = 1300 FT.	AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 230 R.P.M.	AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON	S.A.S. CONFIG. - ON

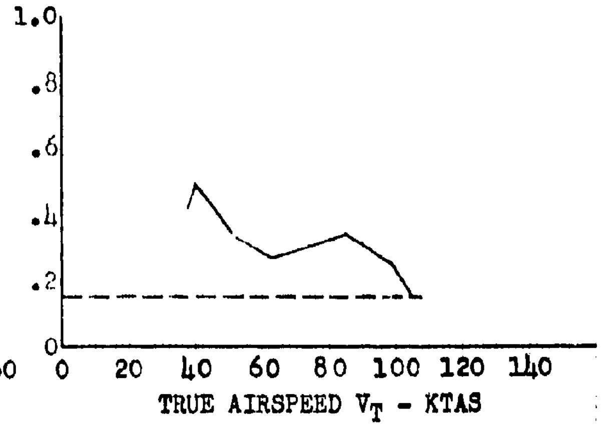
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

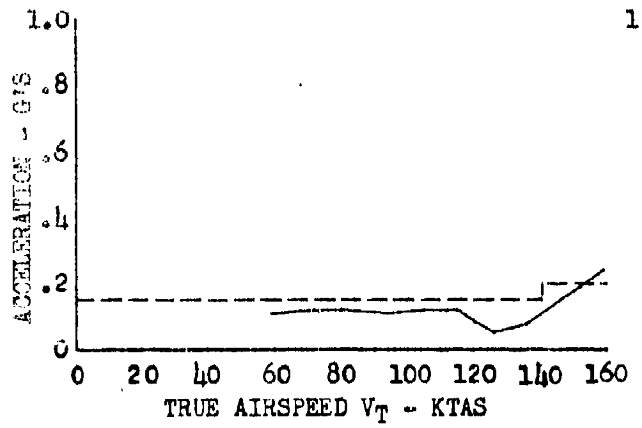
STATION 50 VERTICAL



STATION 50 VERTICAL



STATION 50 LATERAL



STATION 50 LATERAL

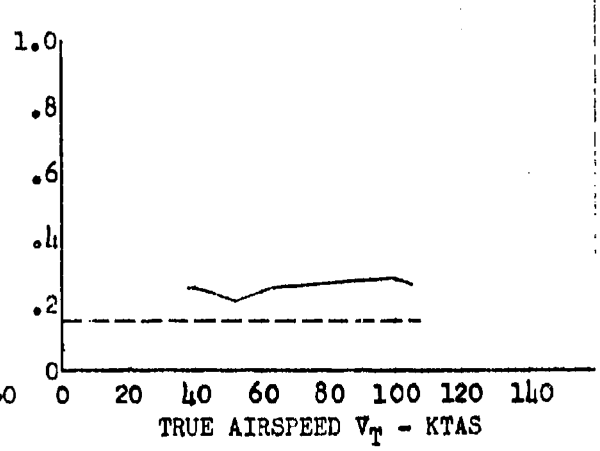


FIGURE NO. [illegible]

6/REV VIBRATION CHARACTERISTICS

CH-47B U.S.A. S/N 66-19100

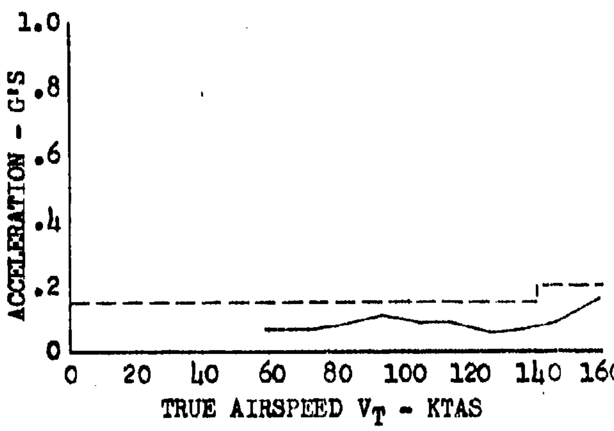
LEVEL FLIGHT

AVG. GROSS WT. = 27000 LB.	AVG. GROSS WT. = 40000 LB.
AVG. C.G. = 331.5 (MID)	AVG. C.G. = 330.2 (MID)
AVG. DENSITY ALT. = 1300 FT.	AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 230 R.P.M.	AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. = ON	S.A.S. CONFIG. = ON

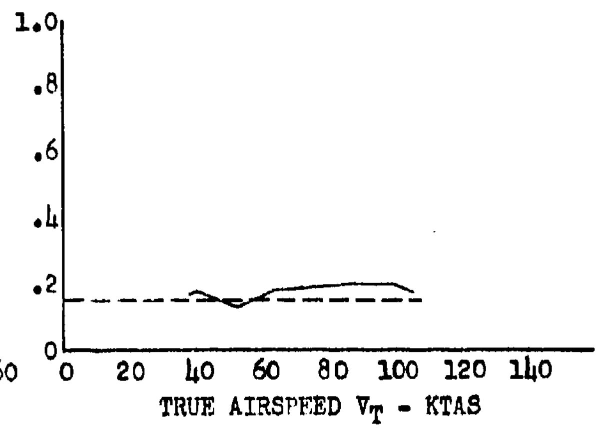
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

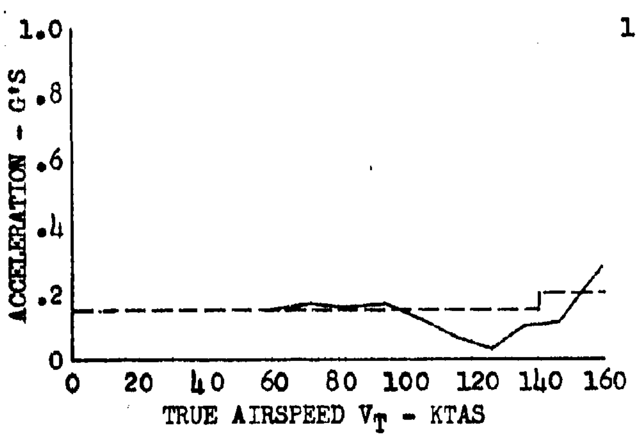
STATION 95 VERTICAL



STATION 95 VERTICAL



STATION 320 VERTICAL



STATION 320 VERTICAL

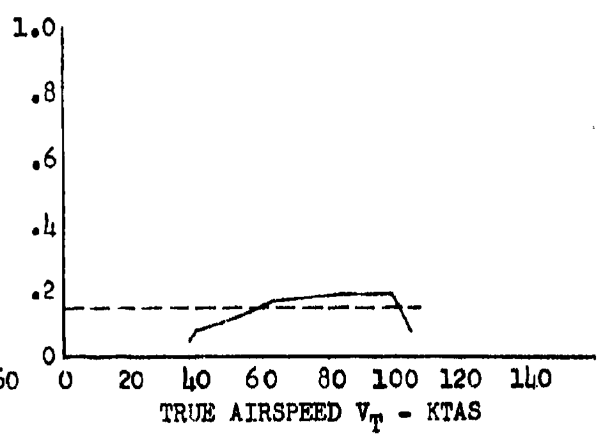


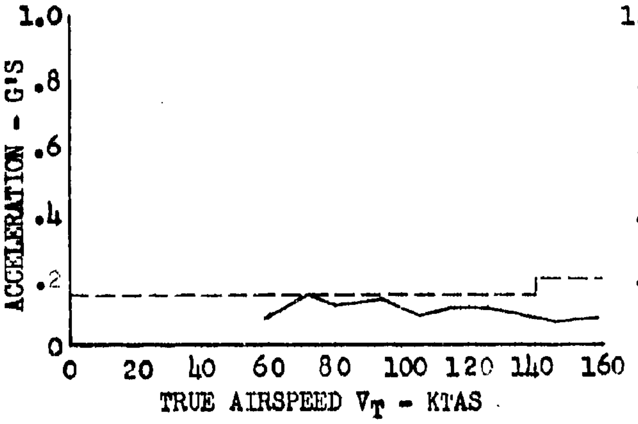
FIGURE NO. [illegible]
[illegible] VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

AVG. GROSS WT. = 27000 LB.	AVG. GROSS WT. = 40000 LB.
AVG. C.G. = 331.5 (MID)	AVG. C.G. = 330.2 (MID)
AVG. DENSITY ALT. = 1300 FT.	AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 230 R.P.M.	AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON	S.A.S. CONFIG. - ON

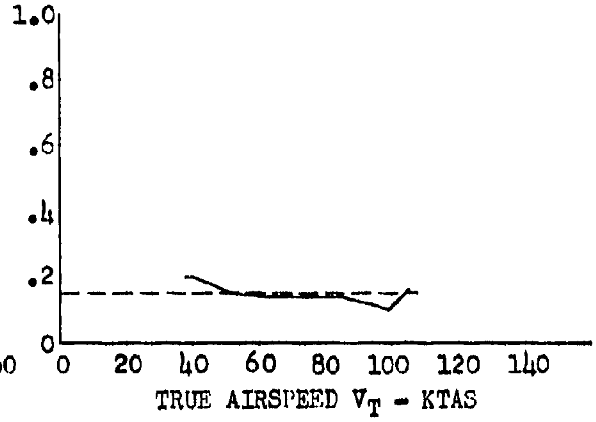
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

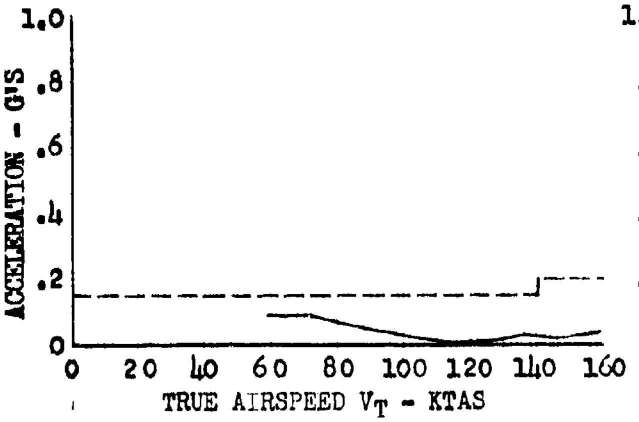
STATION 95 LATERAL



STATION 95 LATERAL



STATION 320 LATERAL



STATION 320 LATERAL

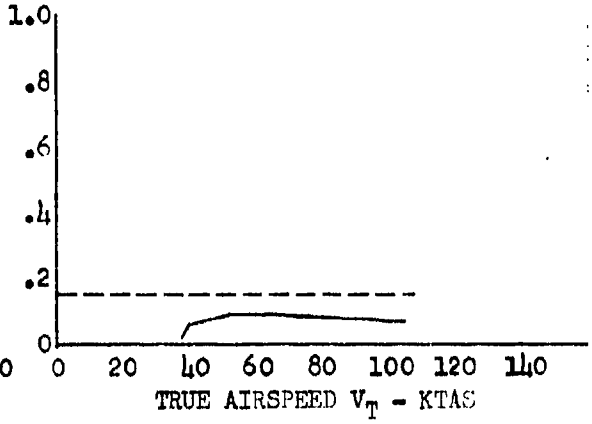


FIGURE NO. 21

6/REV VIBRATION CHARACTERISTICS

CH-47B U.S.A. S/N 66-19100

LEVEL FLIGHT

AVG. GROSS WT. = 37000 LB.
AVG. C.G. = 331.9 (MID)
AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.
S.A.S. CONFIG. - ON

AVG. GROSS WT. = 37000 LB.
AVG. C.G. = 331.9 (MID)
AVG. DENSITY ALT. = 5000 FT
AVG. ROTOR SPEED = 225 R.P.M.
S.A.S. CONFIG. - ON

SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

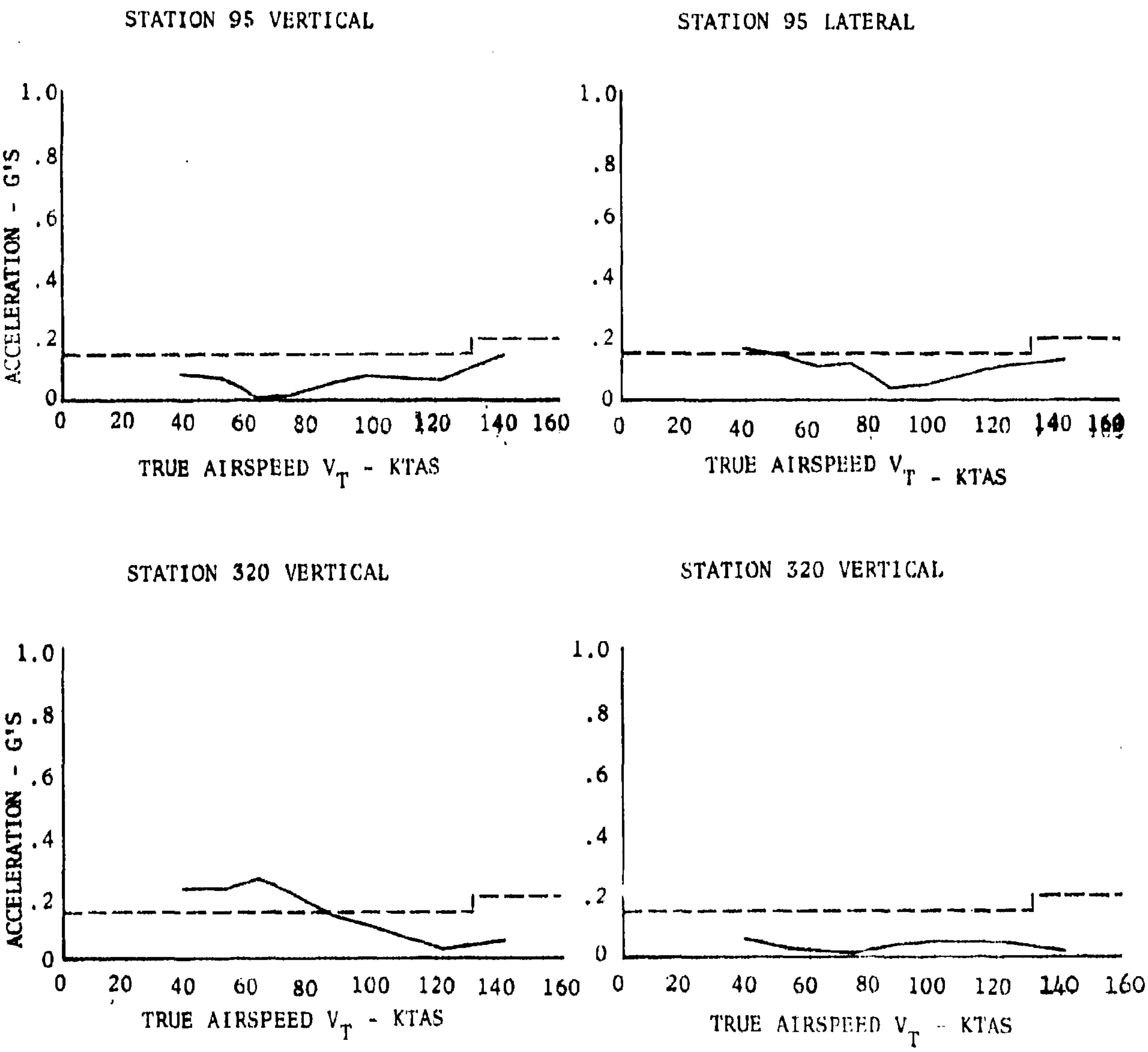


FIGURE NO. 218
1/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

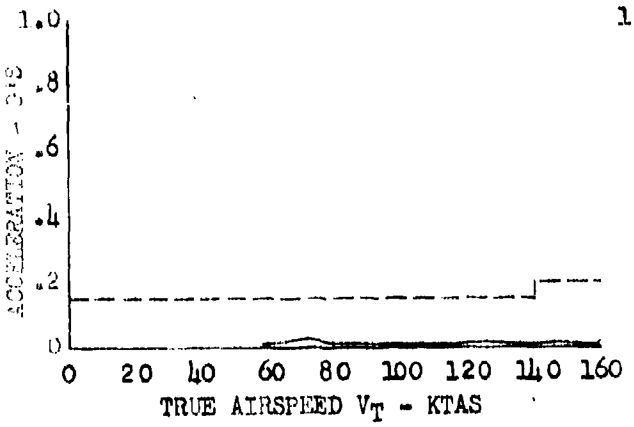
AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 331.5 (MID)
AVG. DENSITY ALT. = 1300 FT.
AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON

AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 330.9 (MID)
AVG. DENSITY ALT. = 11000 FT.
AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON

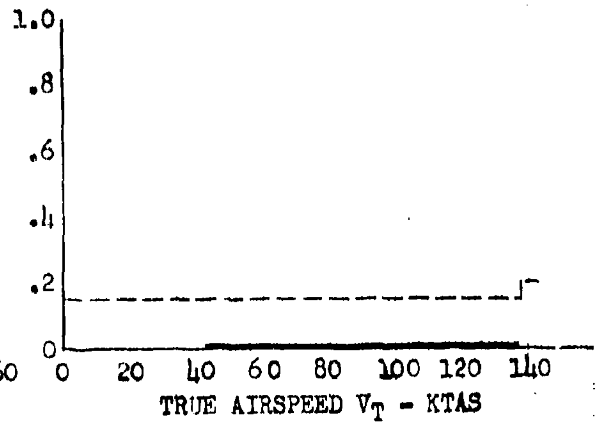
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS

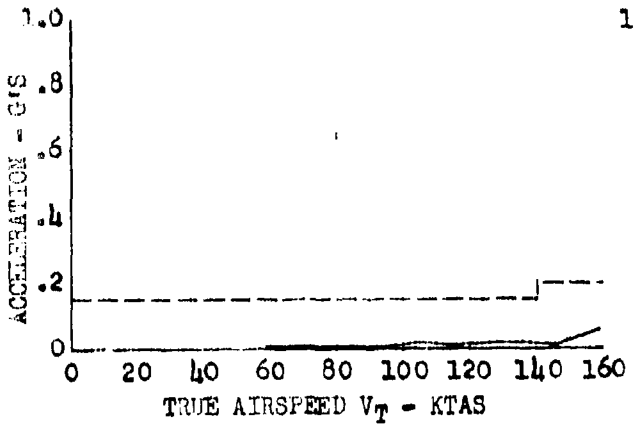
STATION 95 VERTICAL



STATION 95 VERTICAL



STATION 320 VERTICAL



STATION 320 VERTICAL

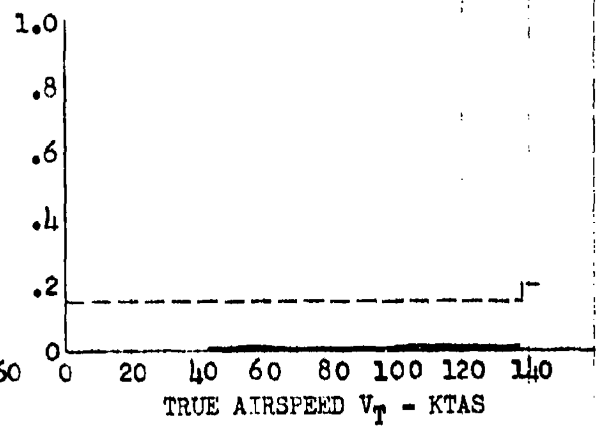


FIGURE NO. 219

1/REV VIBRATION CHARACTERISTICS

CH-47B U.S.A. S/N 66-19100

LEVEL FLIGHT

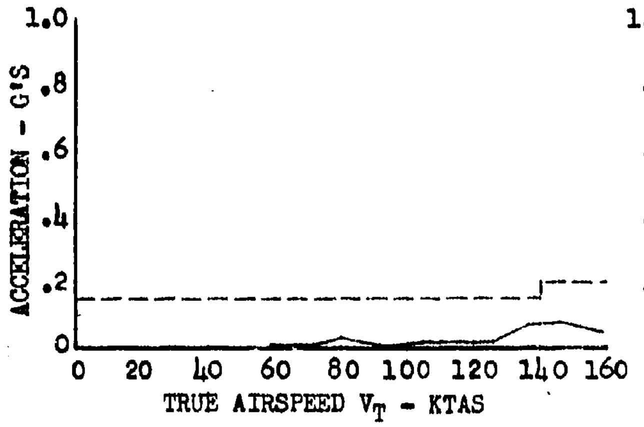
AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 331.5 (MID)
AVG. DENSITY ALT. = 1300 FT.
AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON

AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 330.9 (MID)
AVG. DENSITY ALT. = 11000 FT.
AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON

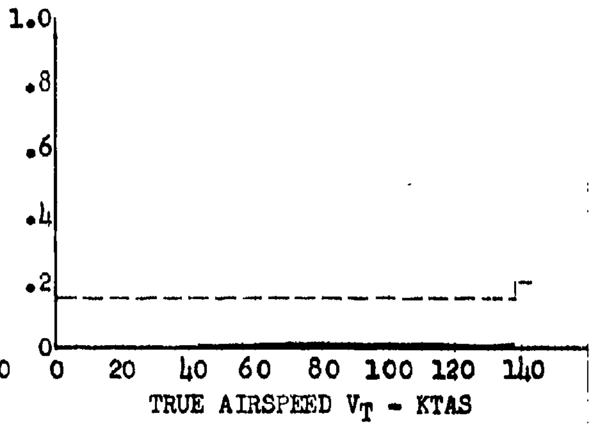
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

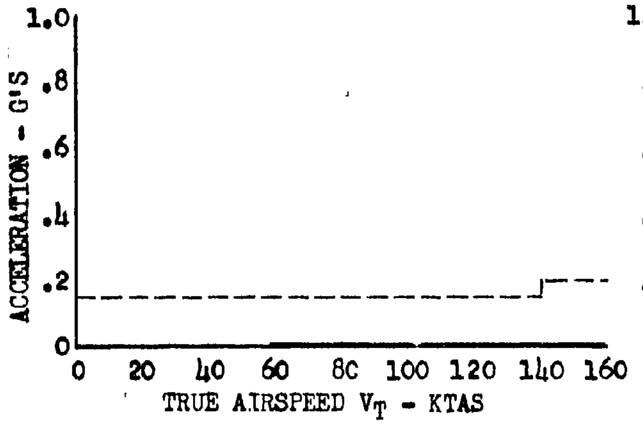
STATION 95 LATERAL



STATION 95 LATERAL



STATION 320 LATERAL



STATION 320 LATERAL

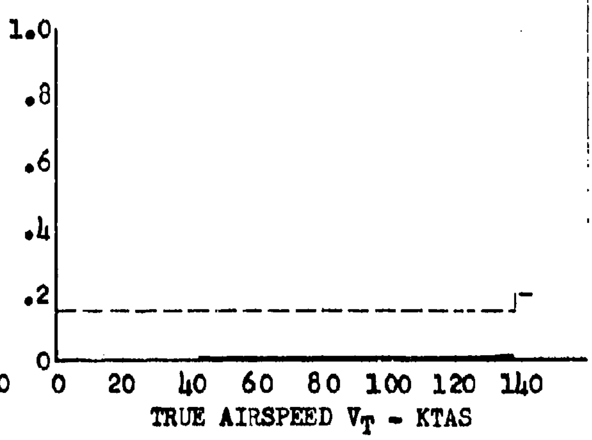


FIGURE NO. 230

3/REV VIBRATION CHARACTERISTICS

CH-47B U.S.A. S/N 66-19100

LEVEL FLIGHT

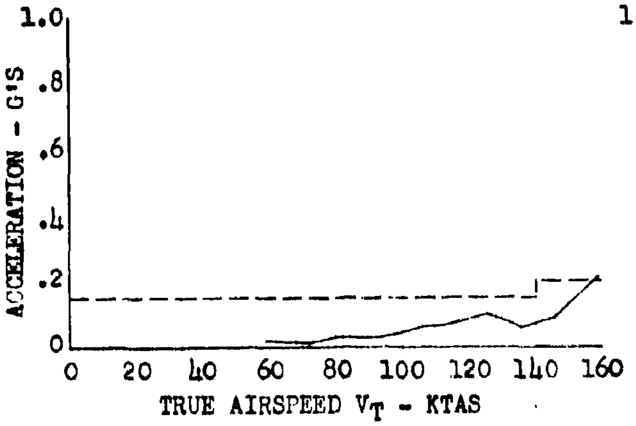
AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 331.5 (MID)
AVG. DENSITY ALT. = 1300 FT.
AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON

AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 330.9 (MID)
AVG. DENSITY ALT. = 11000 FT.
AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON

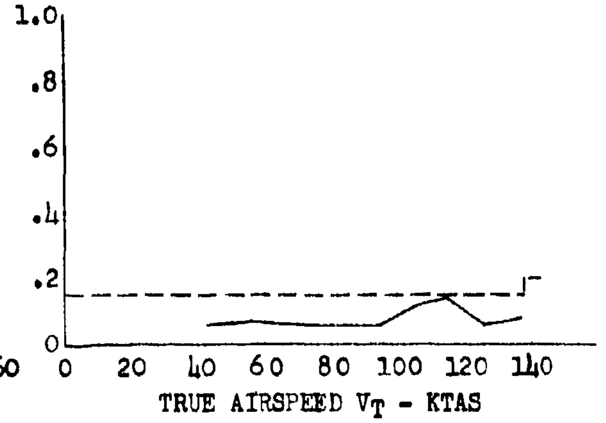
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

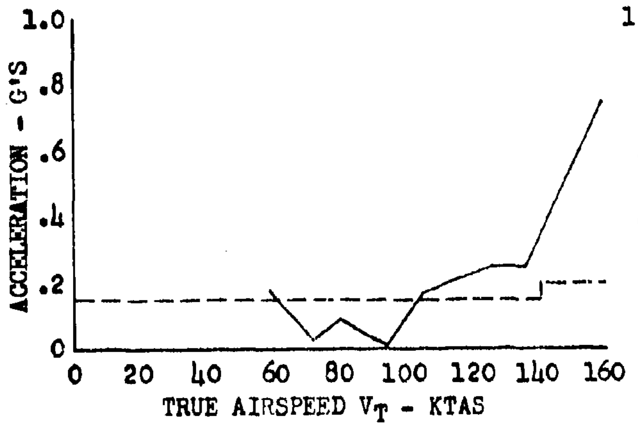
STATION 95 VERTICAL



STATION 95 VERTICAL



STATION 320 VERTICAL



STATION 320 VERTICAL

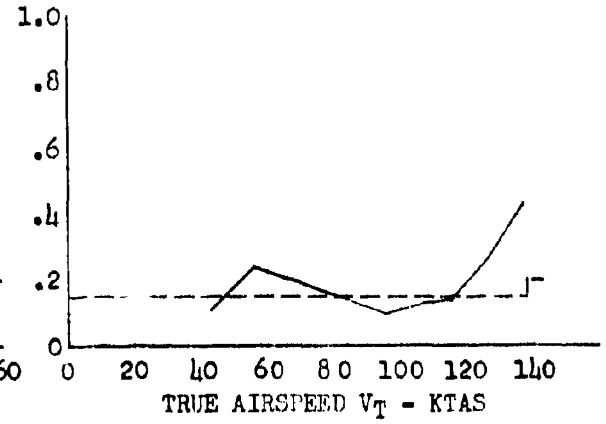


FIGURE NO. [illegible]

3/REV VIBRATION CHARACTERISTICS

CH-47B U.S.A. S/N 66-19100

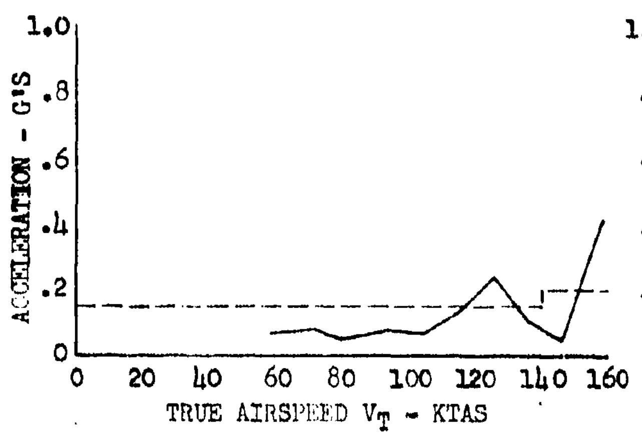
LEVEL FLIGHT

AVG. GROSS WT. = 27000 LB.	AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 331.5 (MID)	AVG. C.G. = 330.9 (MID)
AVG. DENSITY ALT. = 1300 FT.	AVG. DENSITY ALT. = 11000 FT.
AVG. ROTOR SPEED = 230 R.P.M.	AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON	S.A.S. CONFIG. - ON

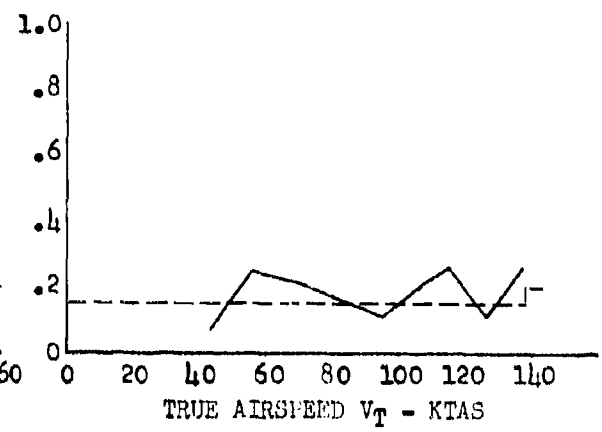
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS .

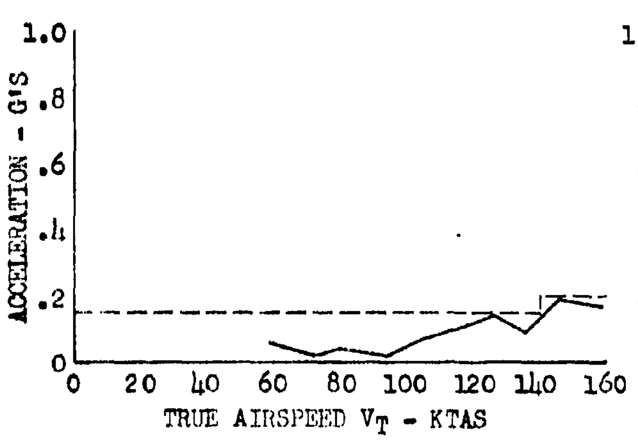
STATION 95 LATERAL



STATION 95 LATERAL



STATION 320 LATERAL



STATION 320 LATERAL

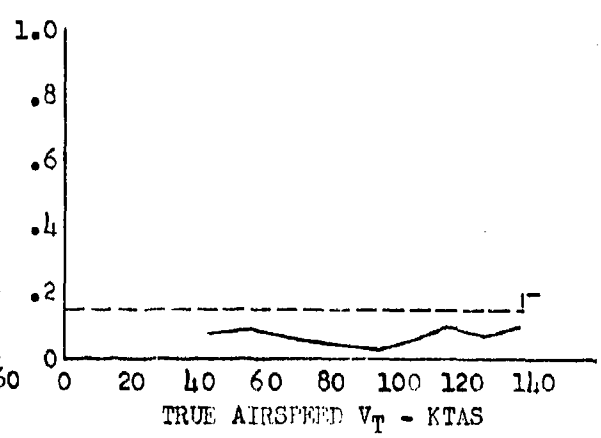


FIGURE NO. 222
6/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

AVG. GROSS WT. = 27000 LB.	AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 330.9 (MID)	AVG. C.G. = 330.9 (MID)
AVG. DENSITY ALT. = 11000 FT.	AVG. DENSITY ALT. = 11000 FT.
AVG. ROTOR SPEED = 230 R.P.M.	AVG. ROTOR SPEED = 230 R.P.M.
S.A.S. CONFIG. - ON	S.A.S. CONFIG. - ON

SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

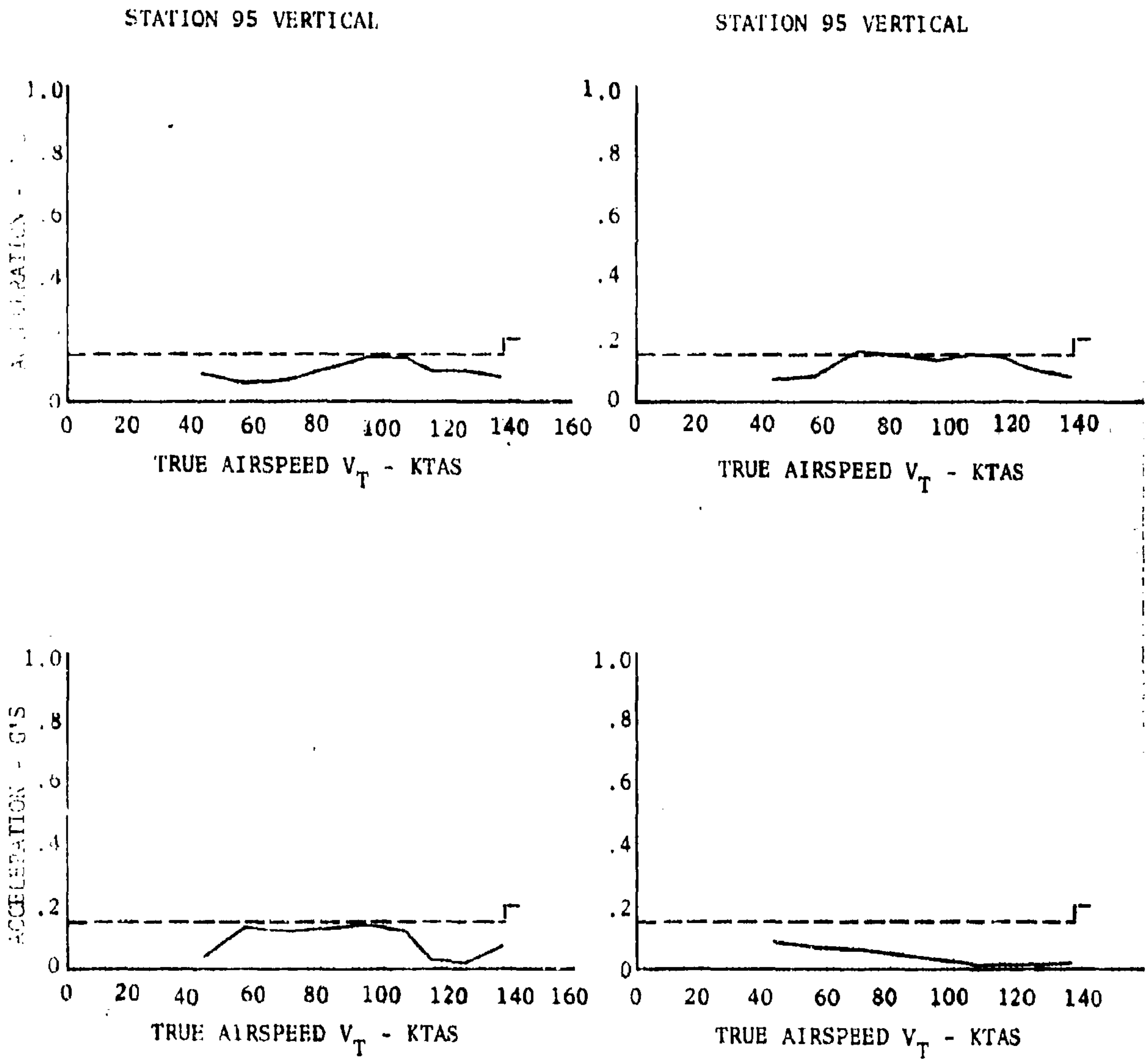


FIGURE NO. 223
1/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

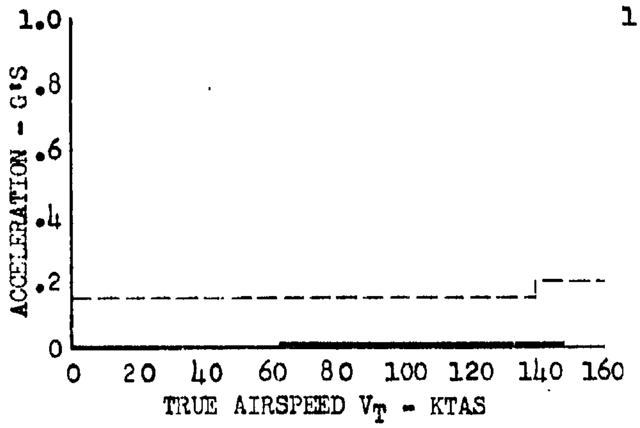
AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 311.2 (FWD)
AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.
S.A.S. CONFIG. = ON

AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 347.2 (AFT)
AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.
S.A.S. CONFIG. = ON

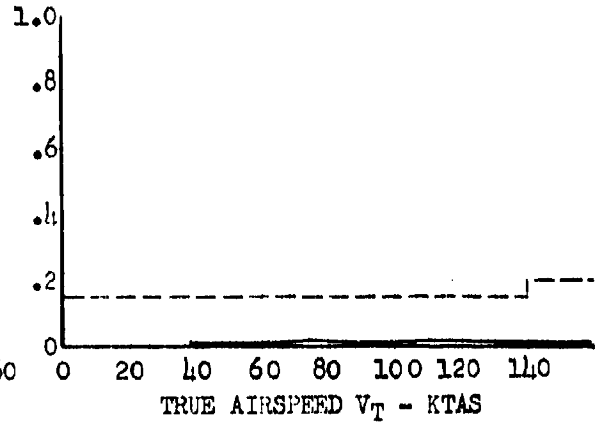
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

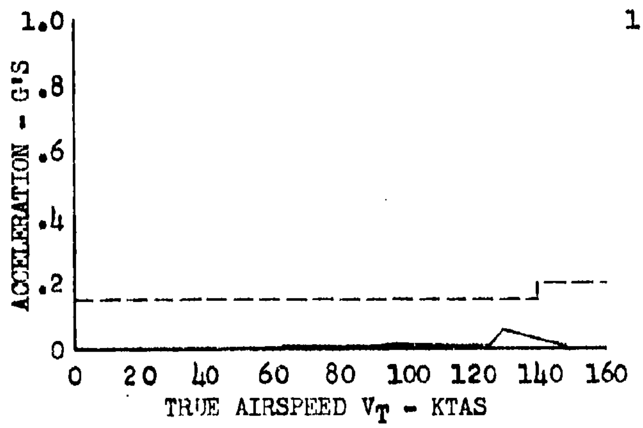
STATION 95 VERTICAL



STATION 95 VERTICAL



STATION 320 VERTICAL



STATION 320 VERTICAL

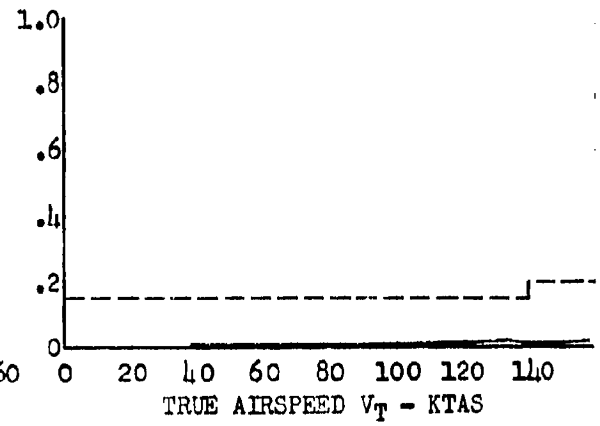


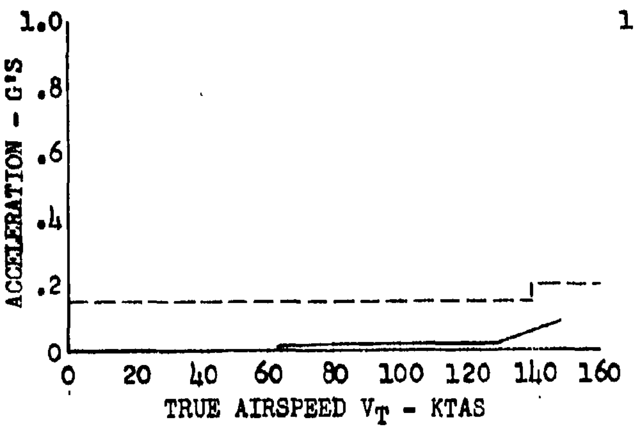
FIGURE NO. 224
1/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

AVG. GROSS WT. = 27000 LB.	AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 311.2 (FWD)	AVG. C.G. = 347.2 (AFT)
AVG. DENSITY ALT. = 5000 FT.	AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.	AVG. ROTOR SPEED = 225 R.P.M.
S.A.S. CONFIG. - ON	S.A.S. CONFIG. - ON

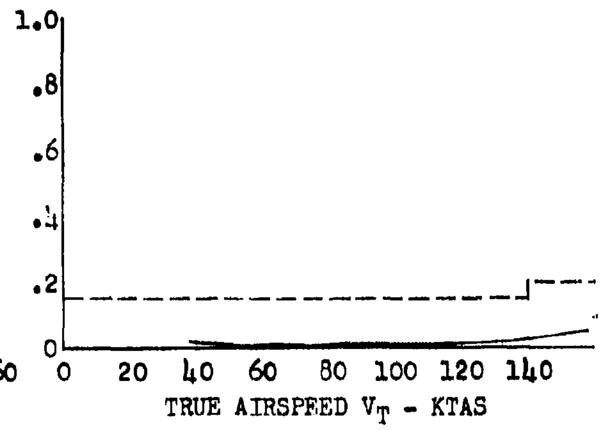
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

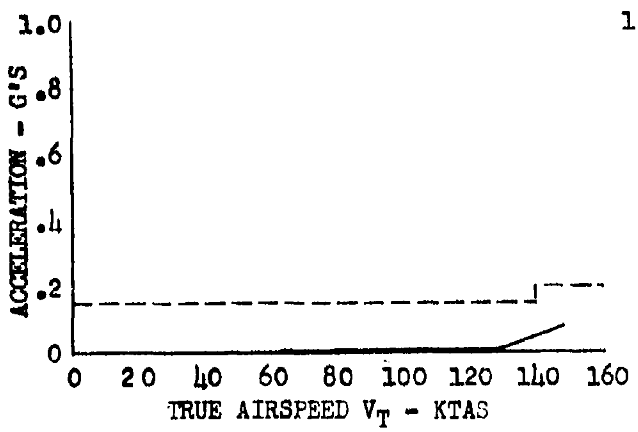
STATION 95 LATERAL



STATION 95 LATERAL



STATION 320 LATERAL



STATION 320 LATERAL

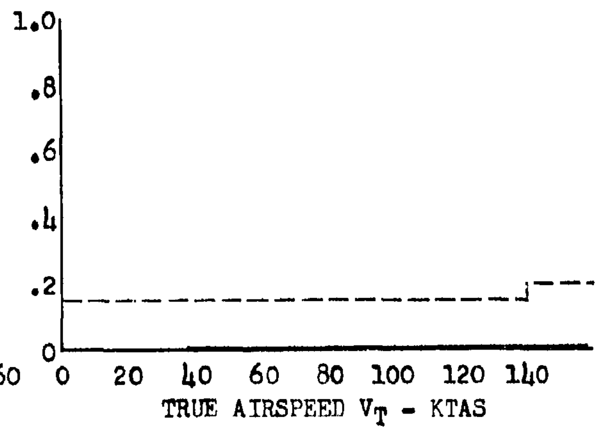


FIGURE NO. 225
3/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

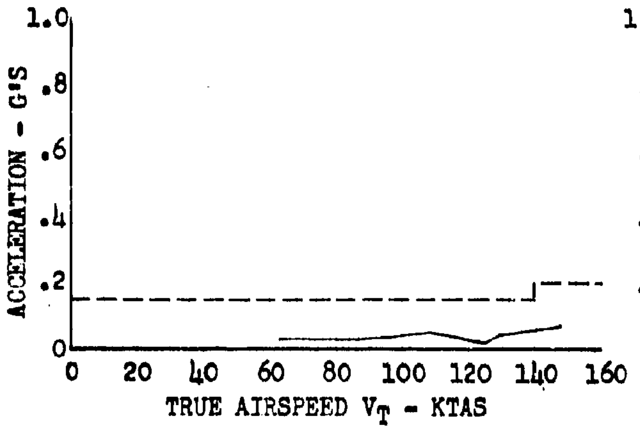
AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 311.2 (FWD)
AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.
S.A.S. CONFIG. - ON

AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 347.2 (AFT)
AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.
S.A.S. CONFIG. - ON

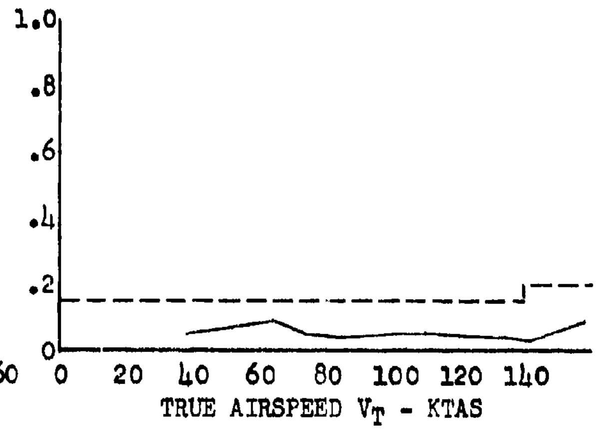
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

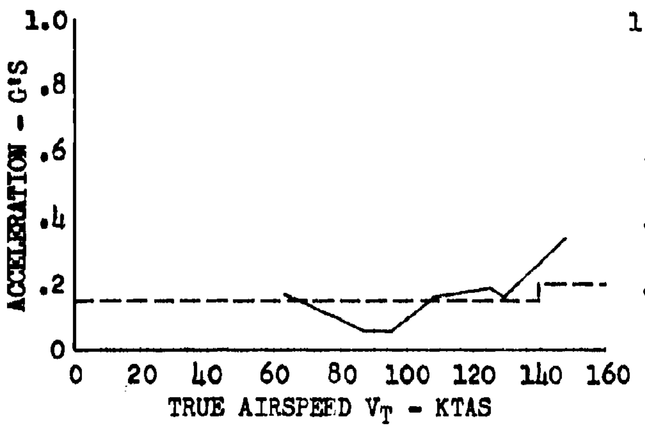
STATION 95 VERTICAL



STATION 95 VERTICAL



STATION 320 VERTICAL



STATION 320 VERTICAL

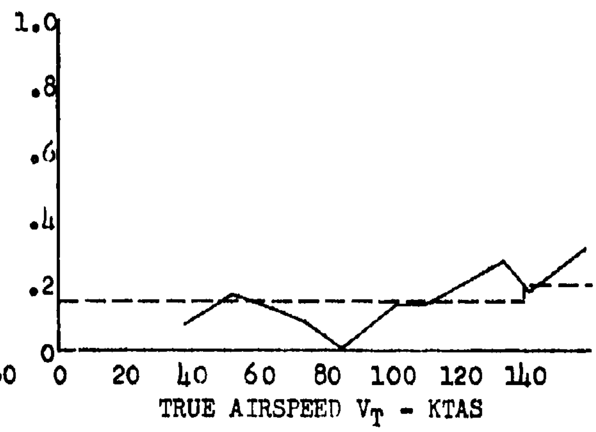


FIGURE NO. 226
3/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

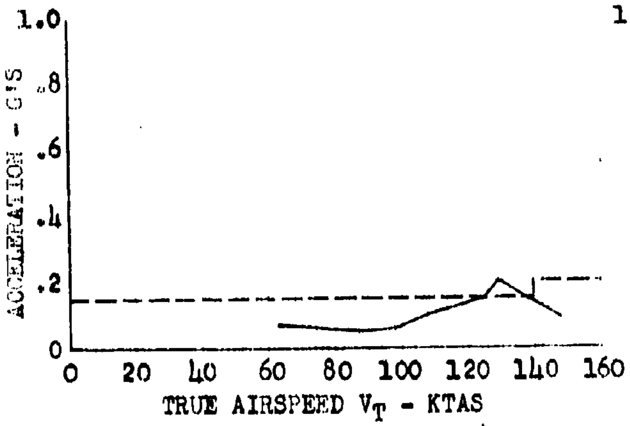
AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 311.2 (FWD)
AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.
S.A.S. CONFIG. - ON

AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 347.2 (AFT)
AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.
S.A.S. CONFIG. - ON

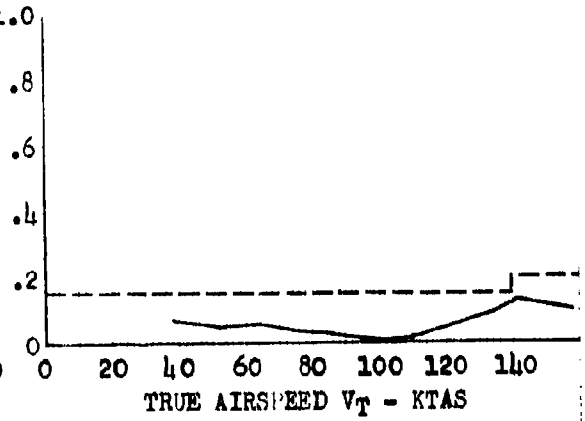
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

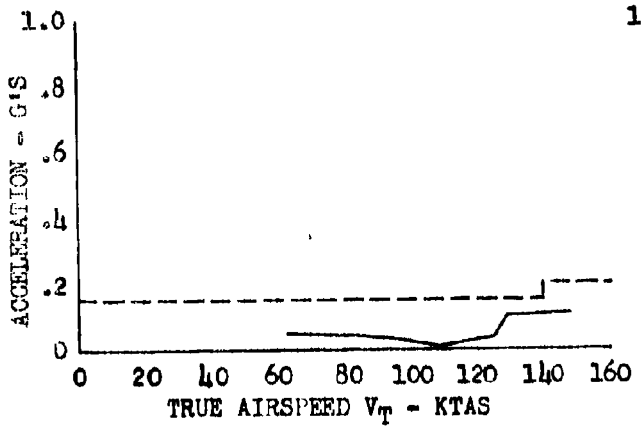
STATION 95 LATERAL



STATION 95 LATERAL



STATION 320 LATERAL



STATION 320 LATERAL

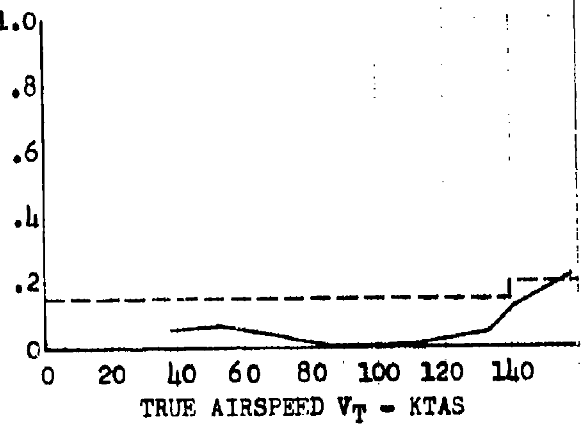


FIGURE NO. 227
6/REV VIBRATION CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
LEVEL FLIGHT

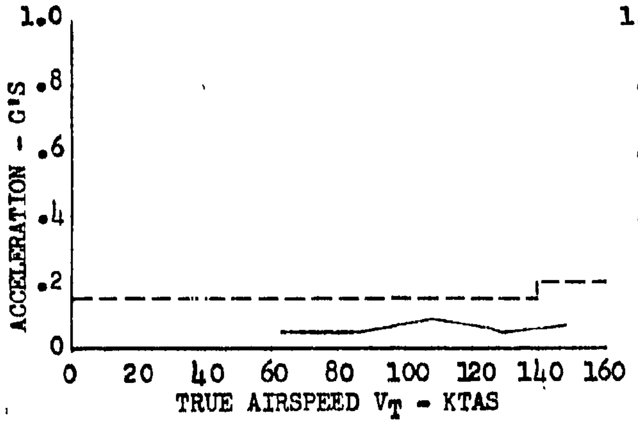
AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 311.2 (FWD)
AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.
S.A.S. CONFIG. - ON

AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 347.2 (AFT)
AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.
S.A.S. CONFIG. - ON

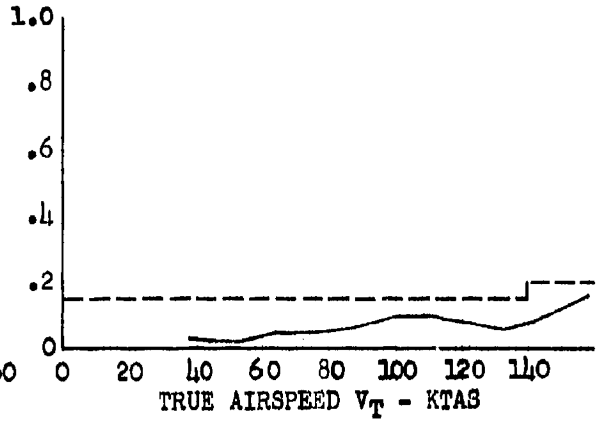
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

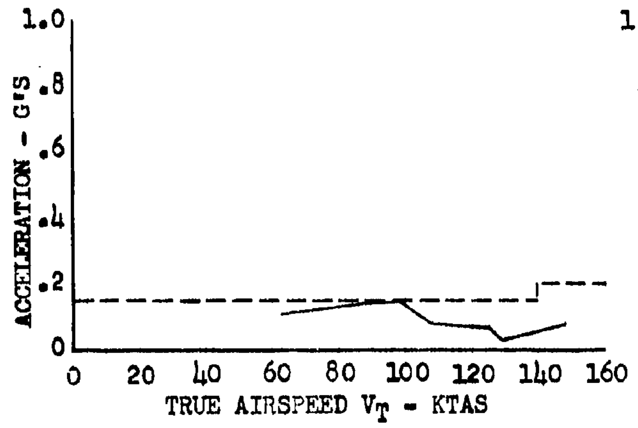
STATION 95 VERTICAL



STATION 95 VERTICAL



STATION 320 VERTICAL



STATION 320 VERTICAL

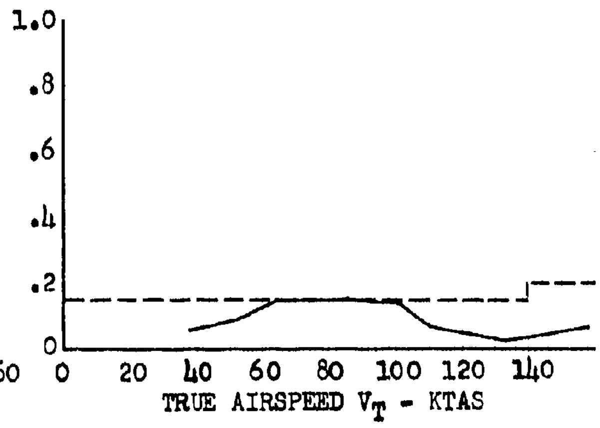


FIGURE NO. 228

6/REV VIBRATION CHARACTERISTICS

CH-47B U.S.A. S/N 66-19100

LEVEL FLIGHT

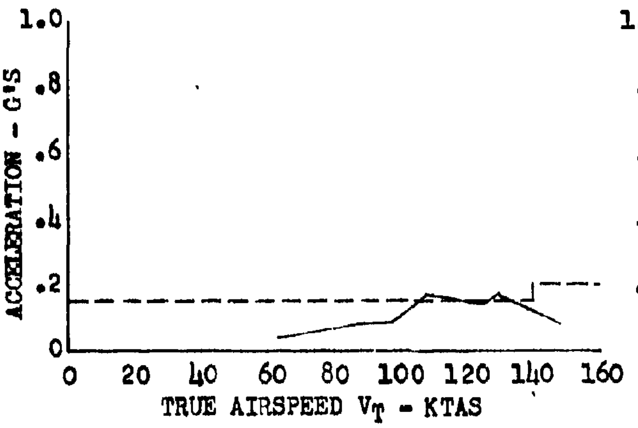
AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 311.2 (FWD)
AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.
S.A.S. CONFIG. - ON

AVG. GROSS WT. = 27000 LB.
AVG. C.G. = 347.2 (AFT)
AVG. DENSITY ALT. = 5000 FT.
AVG. ROTOR SPEED = 225 R.P.M.
S.A.S. CONFIG. - ON

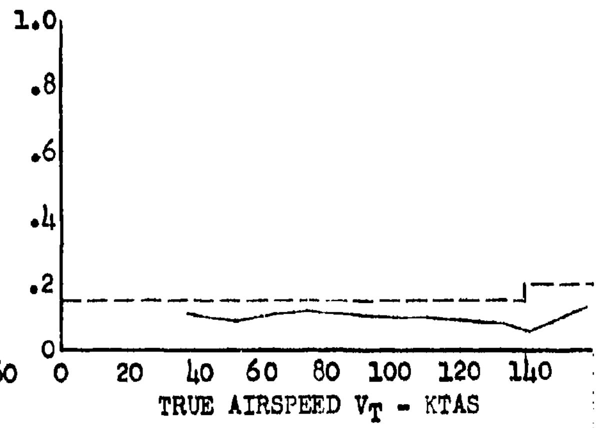
SPEED TRIM (D.C.P. & LONG. CYCLIC) = AUTO.

NOTE: DASH LINES DENOTE MIL-H-8501A LIMITS.

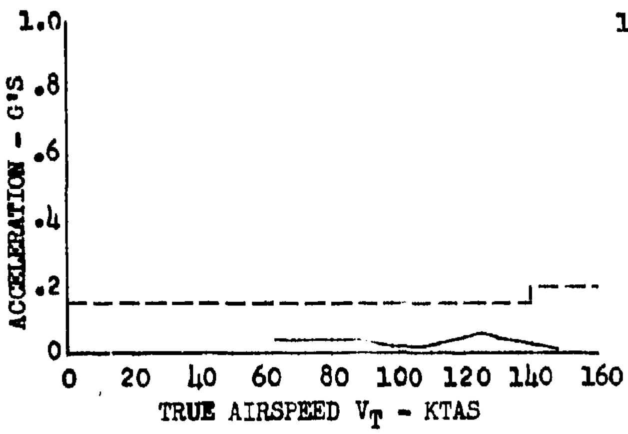
STATION 95 LATERAL



STATION 95 LATERAL



STATION 320 LATERAL



STATION 320 LATERAL

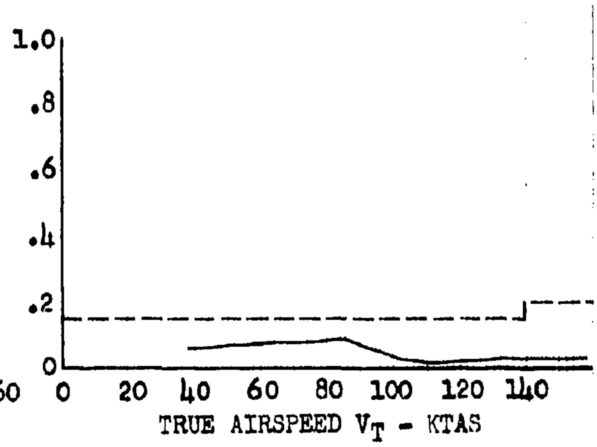


FIGURE NO. 229
ENGINE INLET CHARACTERISTICS
CH-47B USA S/N 66-19100
T55-L-7C S/N LEO 3202 & LEO 3204

SYM	AVG PRESSURE ALTITUDE FT	AVG GROSS WEIGHT LB	AVG C.G. IN	AVG ROTOR SPEED RPM
⊙	3000	27000	MID	230
⊡	6000	27000	MID	230
△	10000	27000	MID	230

NOTE:

1. CLEAR SYMBOLS DENOTE LEO 3204 AND SHADED SYMBOLS DENOTE LEO 3203.
2. ALL DATA MEASURED DURING STABILIZED LEVEL FLIGHT AND HOVER.

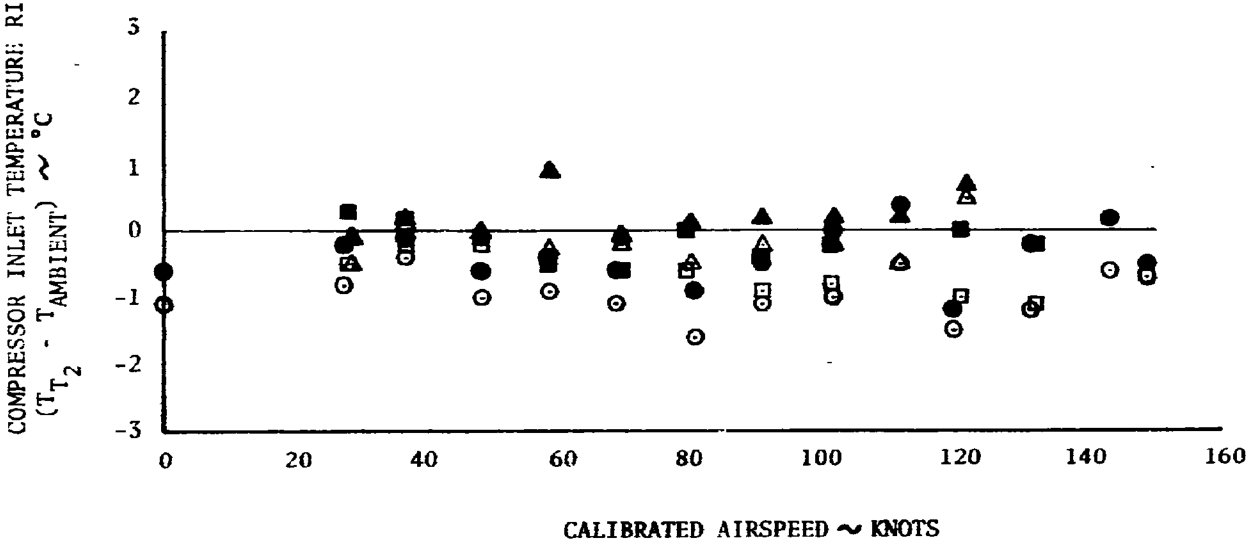


FIGURE NO. 230

ENGINE INLET CHARACTERISICS

CH-47B U.S.A. S/N 66-19100

T55-L-7C S/N LEO 3202 & LEO 3204

SYM.	AVG. PRESSURE ALTITUDE FT.	AVG. GROSS WEIGHT LB.	AVG. C.G. IN.	AVG. ROTOR SPEED R.P.M.
⊡	2200	37000	MID & AFT	230
⊙	3000	27000	MID	230
△	6000	27000	MID	230
◇	10000	27000	MID	230

NOTES:

1. CLEAR SYMBOLS DENOTE LEO 3204 AND SHADED SYMBOLS DENOTE LEO 3202.
2. ALL DATA MEASURED DURING STABILIZED LEVEL FLIGHT AND HOVER.

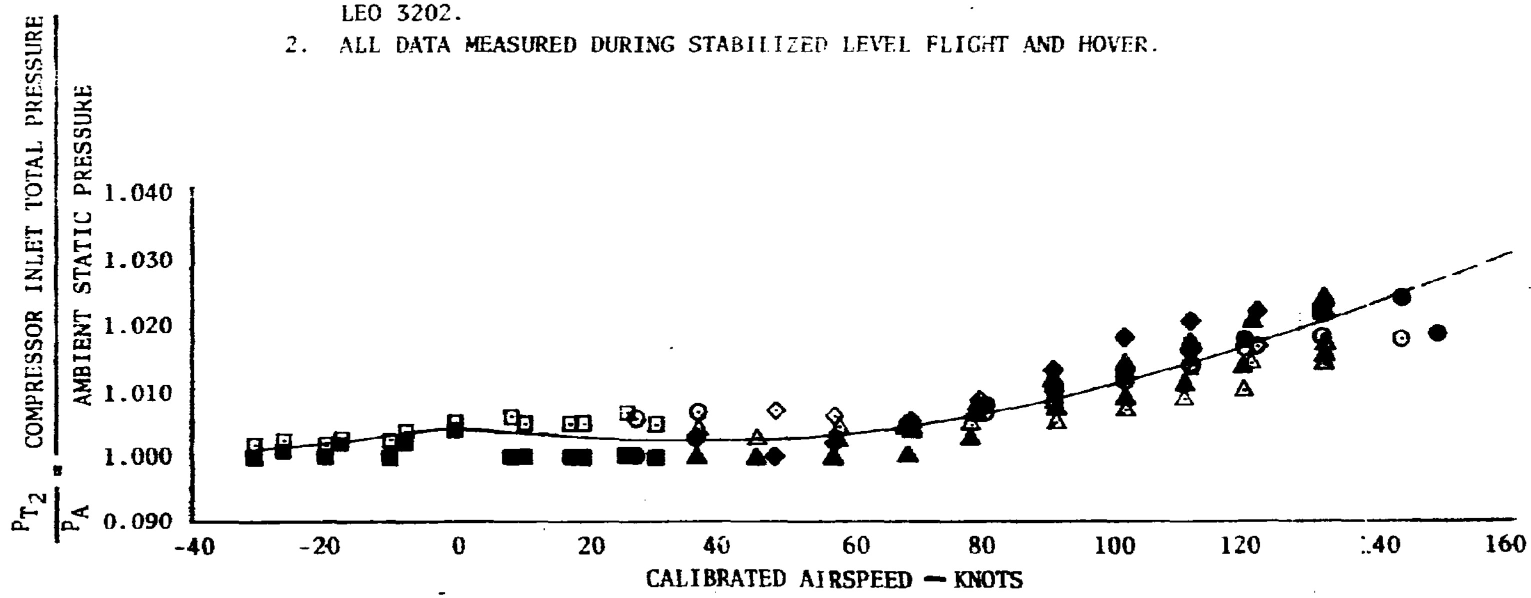


FIGURE NO. 231
TEMPERATURE BIAS CURVE
CH-47B U.S.A. S/N 66-19100
T55-L-7C ENGINES LEO 3202 & LEO 3204

NOTES:

1. TEMPERATURE BIAS CURVE FOR LYCOMING MODEL SPECIFICATION ENGINE OBTAINED FROM TM 55-1520-277-10 C7.
2. S.L. STD. DAY N_1 VALUES AT MAXIMUM POWER FOR TEST ENGINES OBTAINED FROM LYCOMING TEST STAND CALIBRATION.

● T55-L-7C S/N LEO 3204 S.L. STD. DAY N_1 AT MAX. POWER = 95.55 %
△ T55-L-7C S/N LEO 3202 S.L. STD. DAY N_1 AT MAX. POWER = 95.85 %

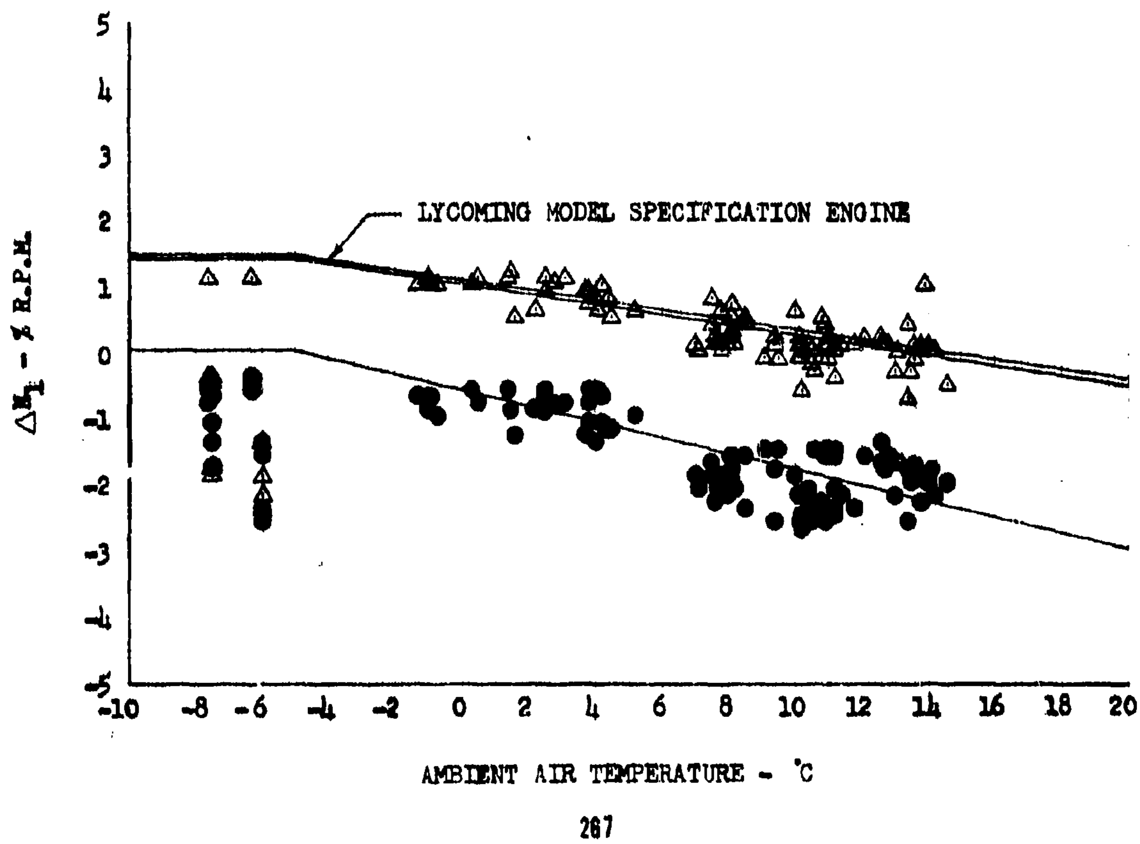


FIGURE NO. 232

MAXIMUM SHAFT HORSEPOWER AVAILABLE

CH-47B U.S.A. S/N 66-19100

STANDARD DAY

LYCOMING T55-L-7C ENGINES LEO 3202 & LEO 3204

NOTE: SOLID LINES OBTAINED FROM FIGURES 231 AND 234 and 250.

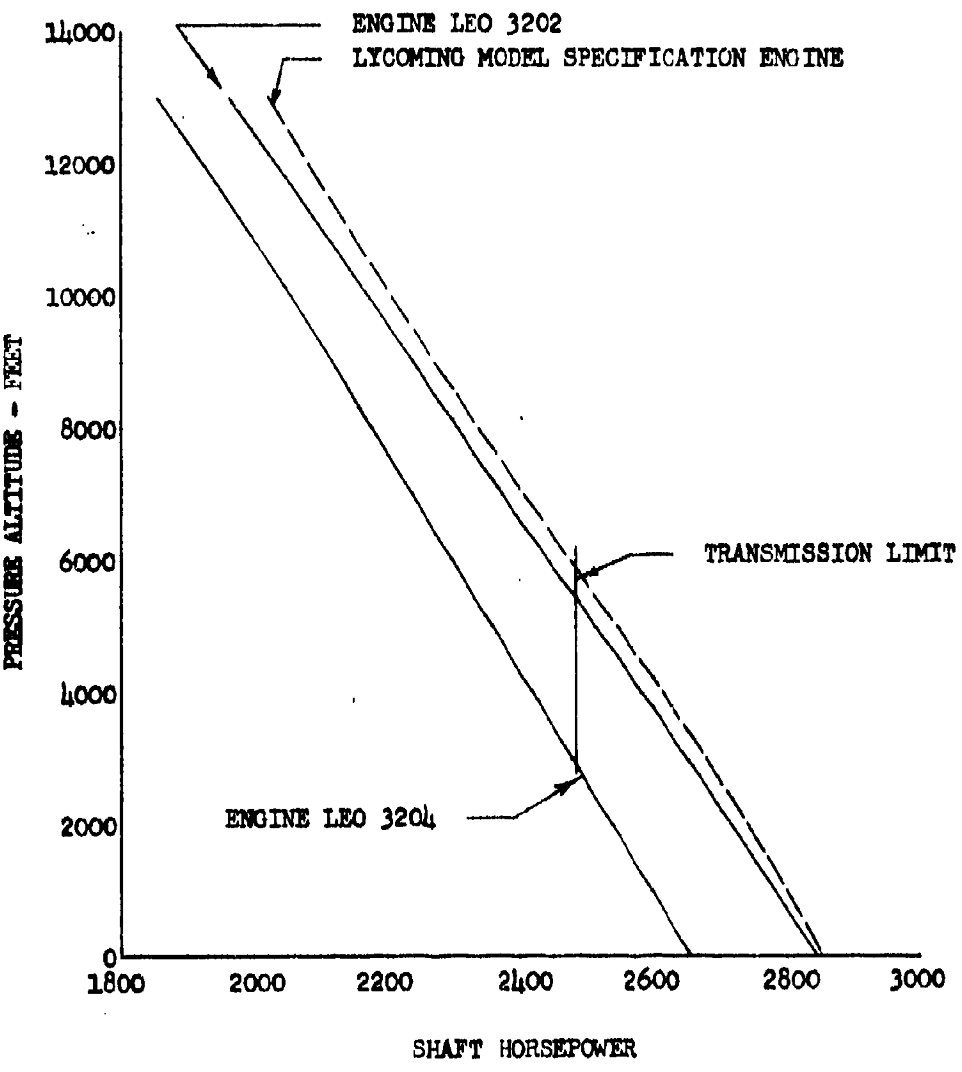


FIGURE NO. 233
NORMAL SHAFT HORSEPOWER AVAILABLE
CH-47B U.S.A. S/N 66-19100
T55-L-7C MODEL SPECIFICATION
225 R.P.M.

NOTES:
1. STATIC CONDITIONS.
2. NO AIR BLEED LOSSES.
3. NO HP EXTRACTION.
4. INLET LOSSES BASED ON FIGURES 229 AND 230.
5. BASED ON AVCO LYCOMING MODEL SPEC. NO. 124.31. T55-L-7C SHAFT TURBINE ENGINE.

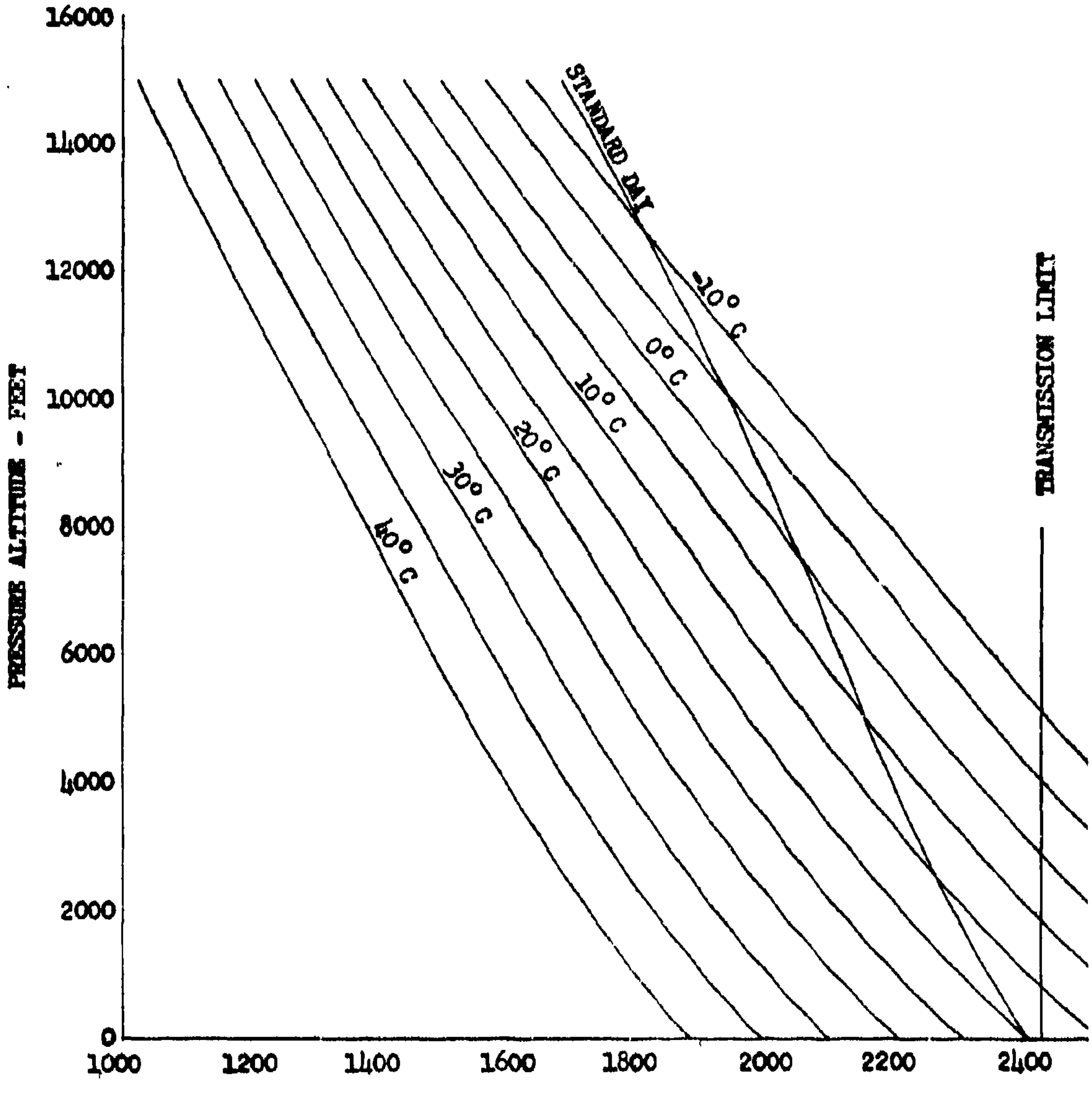


FIGURE NO. 234
NORMAL SHAFT HORSEPOWER AVAILABLE
CH-47B U.S.A. S/N 66-19100
T55-L-7C MODEL SPECIFICATION
230 R.P.M.

NOTES:
1. STATIC CONDITIONS.
2. NO AIR BLEED LOSSES.
3. NO HP EXTRACTION.
4. INLET LOSSES BASED ON FIGURES 229 AND 230.
5. BASED ON AVCO LYCOMING MODEL SPEC. NO. 124.31. T55-L-7C SHAFT TURBINE ENGINE.

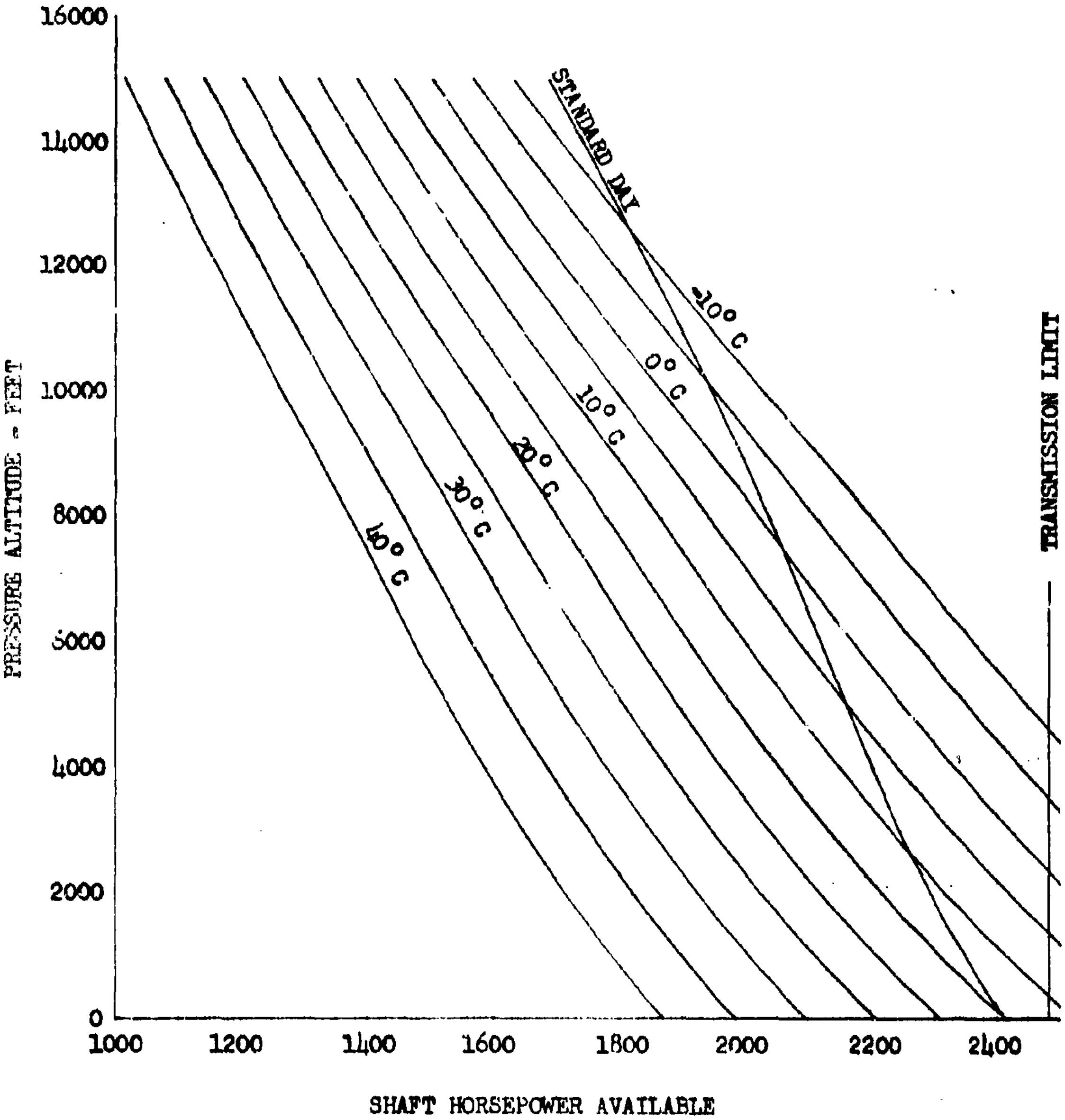


FIGURE NO. 235

MILITARY SHAFT HORSEPOWER AVAILABLE

CH-47B U.S.A. S/N 66-19100

T55-L-7C MODEL SPECIFICATION

225 R.P.M.

NOTES:

1. STATIC CONDITIONS.
2. NO AIR BLEED LOSSES.
3. NO HP EXTRACTION.
4. INLET LOSSES BASED ON FIGURES 229 AND 230.
5. BASED ON AVCO LYCOMING MODEL SPEC. NO. 124.31, T55-L-7C SHAFT TURBINE ENGINE.

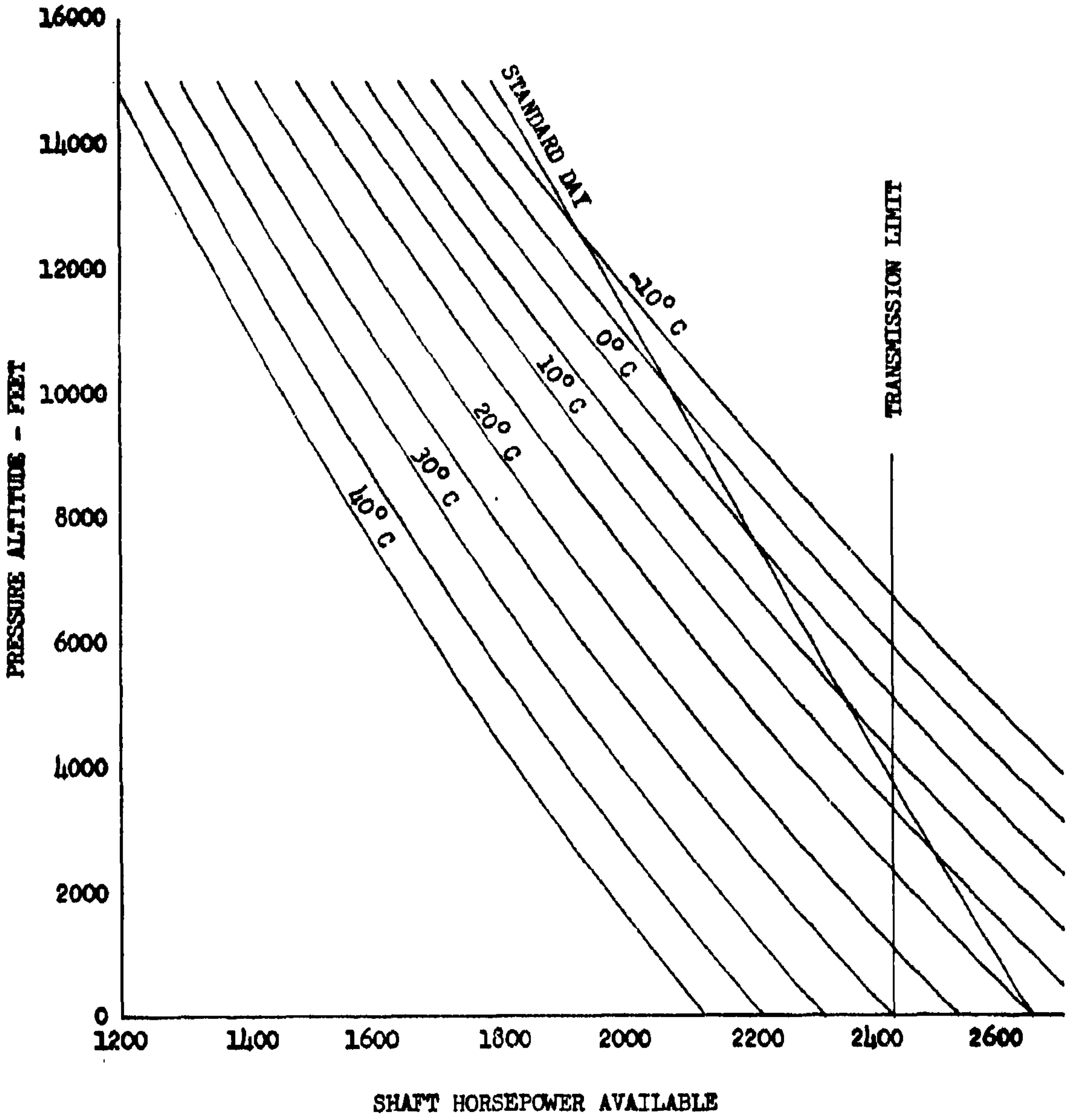
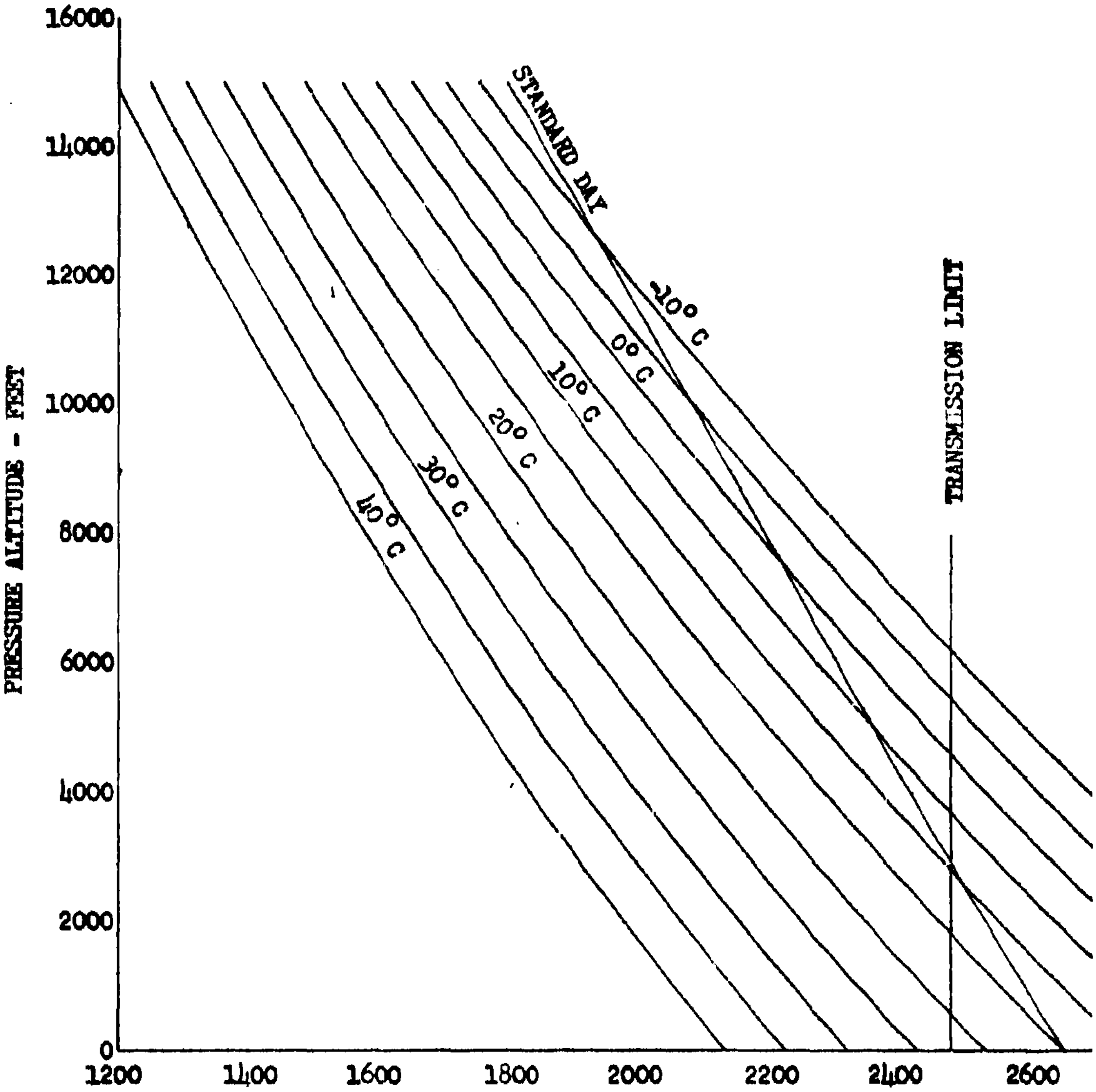


FIGURE NO. 236
MILITARY SHAFT HORSEPOWER AVAILABLE
CH-47B U.S.A. S/N 66-19100
T55-L-7C MODEL SPECIFICATION
230 R.P.M.

NOTES:

1. STATIC CONDITIONS.
2. NO AIR BLEED LOSSES.
3. NO HP EXTRACTION.
4. INLET LOSSES BASED ON FIGURES 229 AND 230.
5. BASED ON AVCO LYCOMING MODEL SPEC. N. 124.31. T55-L-7C SHAFT TURBINE ENGINE.



SHAFT HORSEPOWER AVAILABLE

FIGURE NO. 237
MAXIMUM SHAFT HORSEPOWER AVAILABLE
CH-47B U.S.A. S/N 66-19100
T55-L-7C MODEL SPECIFICATION
225 R.P.M.

NOTES:

1. STATIC CONDITIONS.
2. NO AIR BLEED LOSSES.
3. NO HP EXTRACTION.
4. INLET LOSSES BASED ON FIGURES 229 AND 230.
5. BASED ON AVCO LYCOMING MODEL SPEC. NO. 124.31. T55-L-7C SHAFT TURBINE ENGINE.

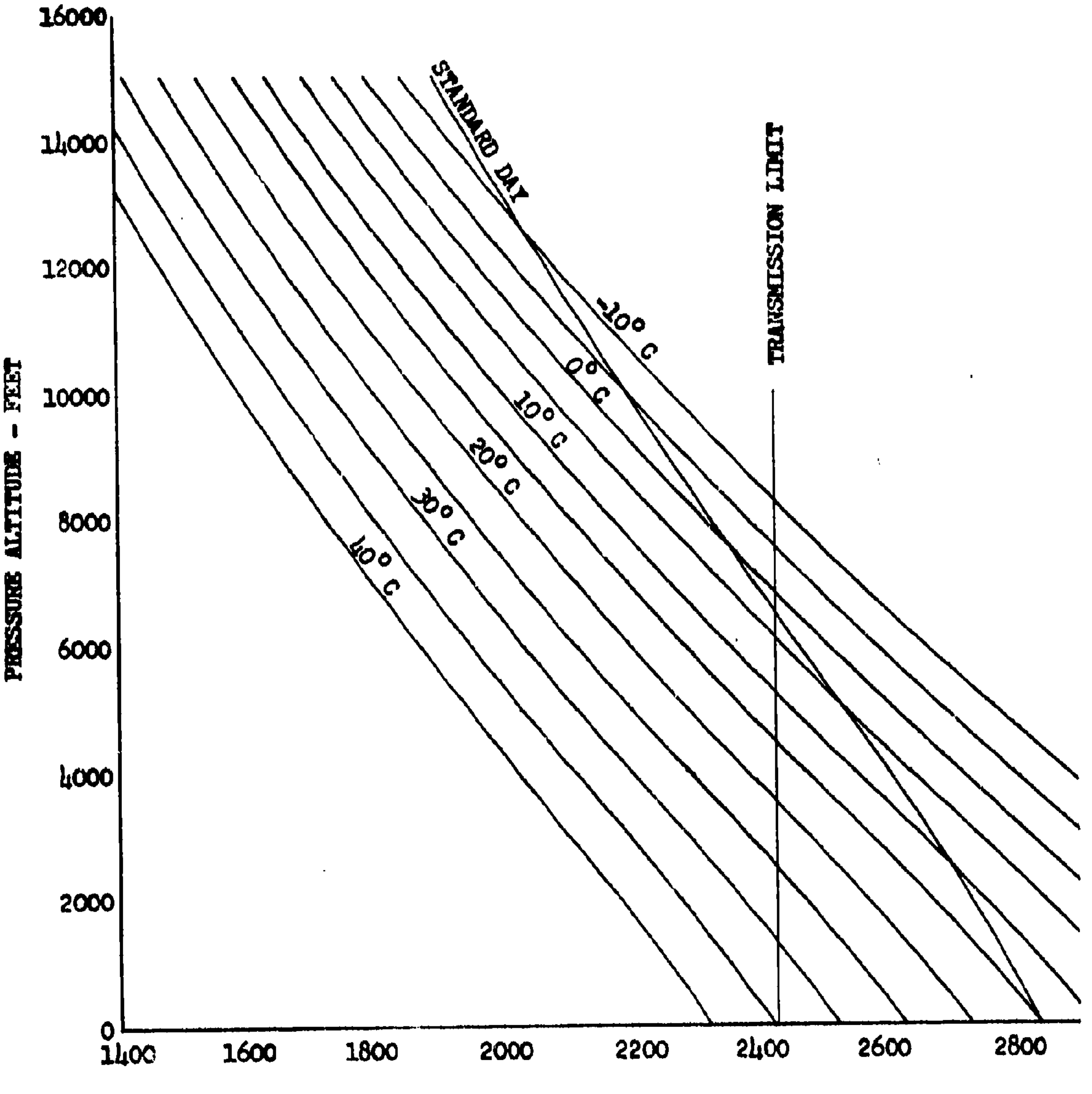


FIGURE NO. 238
MAXIMUM SHAFT HORSEPOWER AVAILABLE
CH-47B U.S.A. S/N 66-19100
T55-L-7C MODEL SPECIFICATION
230 R.P.M.

NOTES:

1. STATIC CONDITIONS.
2. NO AIR BLEED LOSSES.
3. NO HP EXTRACTION.
4. INLET LOSSES BASED ON FIGURES 229 AND 230.
5. BASED ON AVCO LYCOMING MODEL SPEC. NO. 124.31. T55-L-7C SHAFT TURBINE ENGINE.

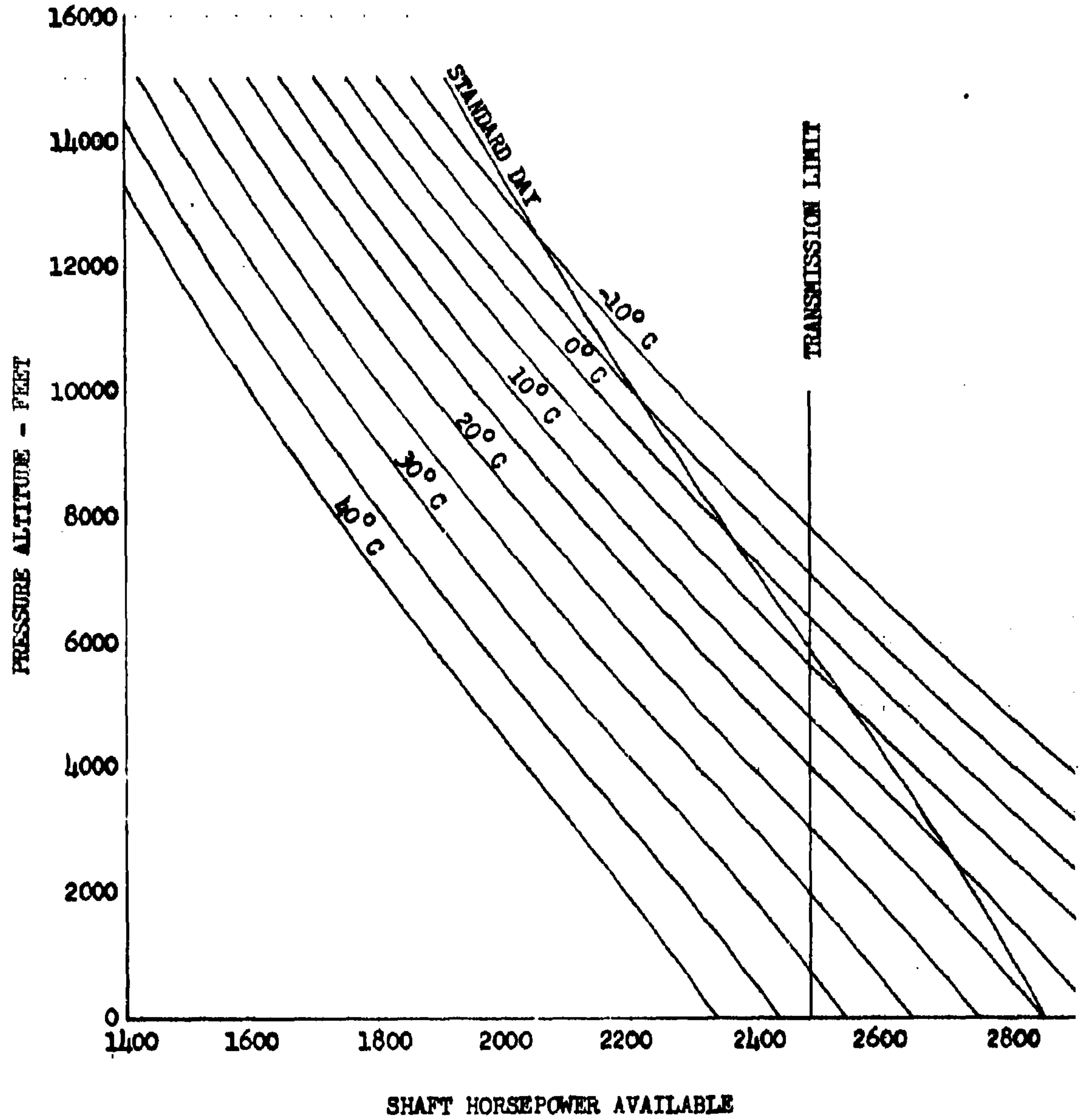


FIGURE NO. 239
SHAFT HORSEPOWER AVAILABLE WITH RAM EFFECTS
CH-47B U.S.A. S/N 66-19100
T55-L-7C MODEL SPECIFICATION
NORMAL POWER RATING - STANDARD DAY
230 R.P.M.

NOTES:

1. BASED ON FIGURES 229 AND 230.
2. BASED ON AVCO LYCOMING MODEL SPEC. NO. 124.31 T55-L-7C SHAFT TURBINE ENGINE.

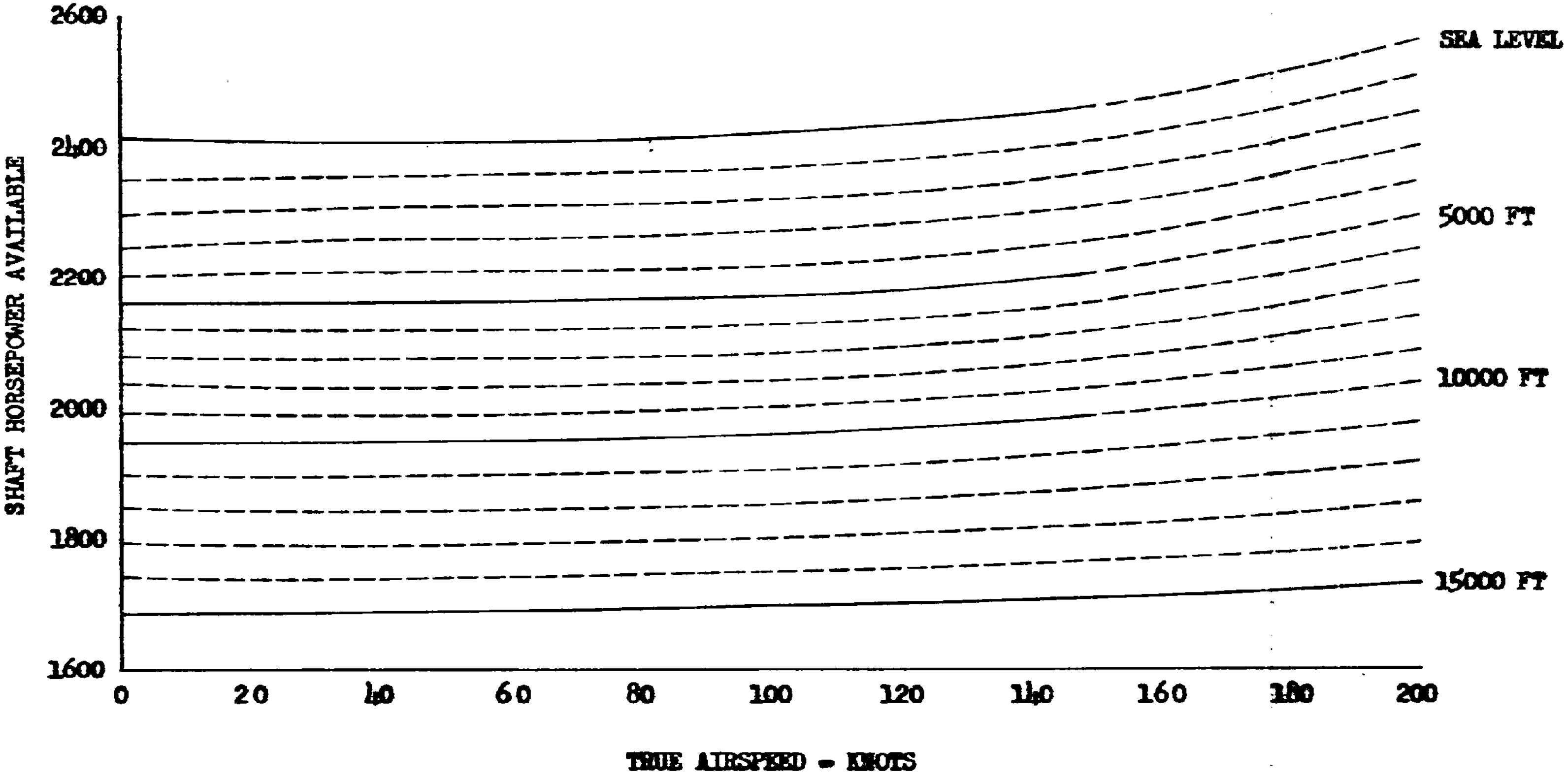


FIGURE NO. 240
SHAFT HORSEPOWER AVAILABLE WITH RAM EFFECTS
CH-47B U.S.A. S/N 66-19100
T55-L-7C MODEL SPECIFICATION
MILITARY POWER RATING - STANDARD DAY
230 R.P.M.

NOTES:
1. BASED ON FIGURES 229 AND 230.
2. BASED ON AVCO LYCOMING MODEL SPEC. NO. 124.31
T55-L-7C SHAFT TURBINE ENGINE.

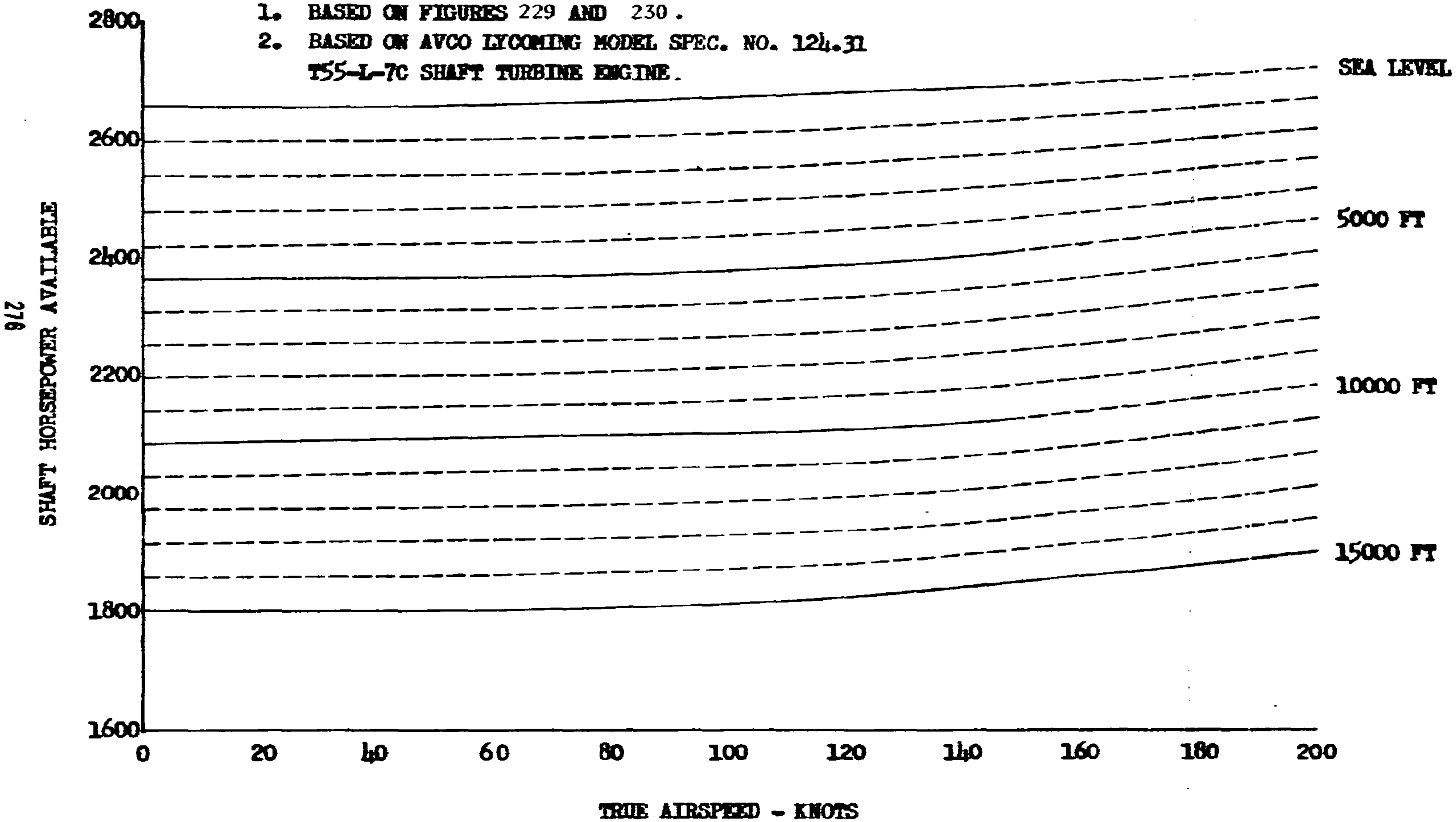


FIGURE NO. 241

SHAFT HORSEPOWER AVAILABLE WITH RAM EFFECTS

CH-47B U.S.A. S/N 66-19100

T55-L-7C MODEL SPECIFICATION

MAXIMUM POWER RATING - STANDARD DAY

230 R.P.M.

NOTES:

1. BASED ON FIGURES 229 AND 230.
2. BASED ON AVCO LYCOMING MODEL SPEC. NO. 124.31 T55-L-7C SHAFT TURBINE ENGINE.

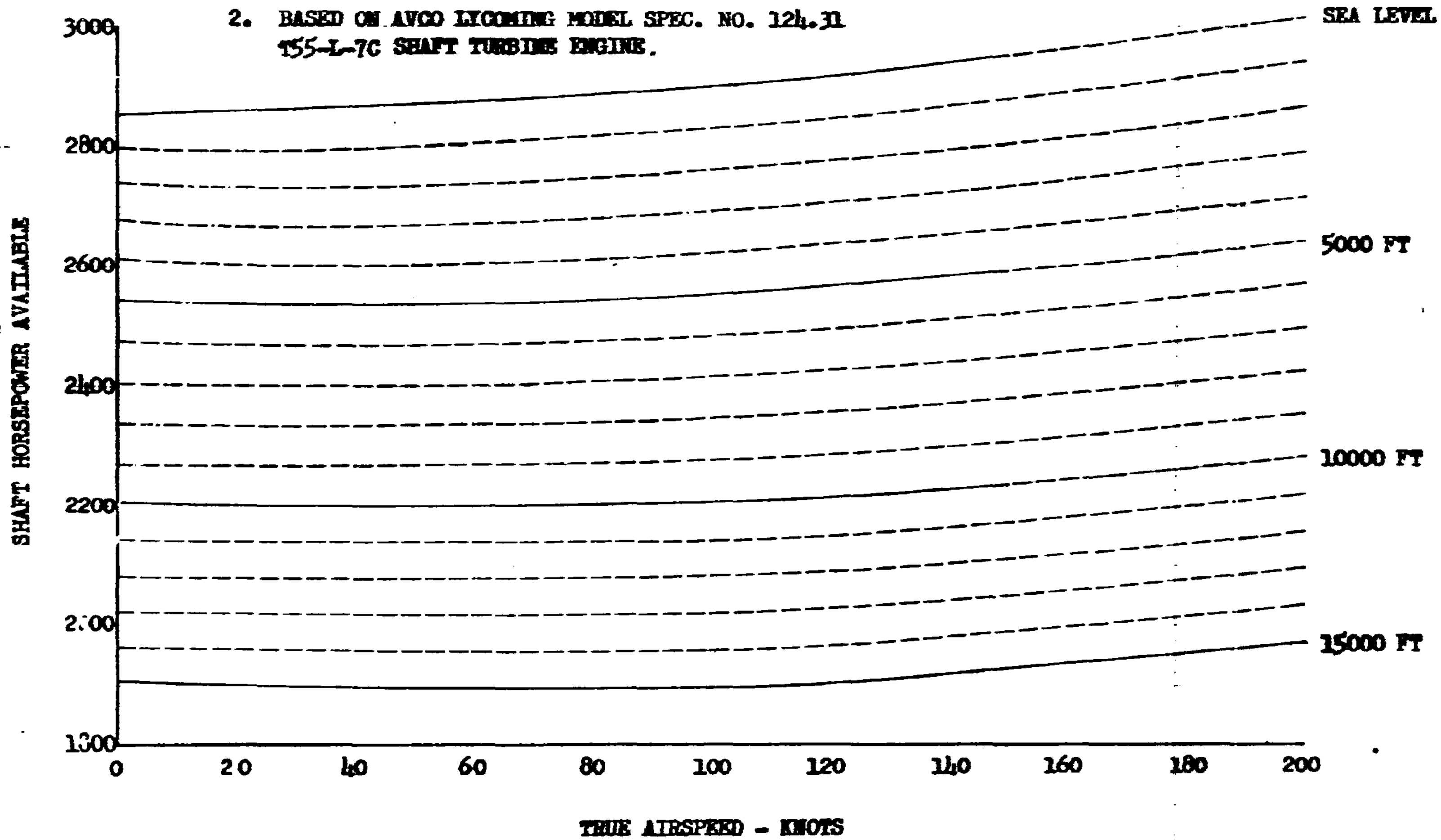


FIGURE NO. 242
FUEL FLOW VERSUS POWER AND ALTITUDE
STANDARD DAY
225 R.P.M.

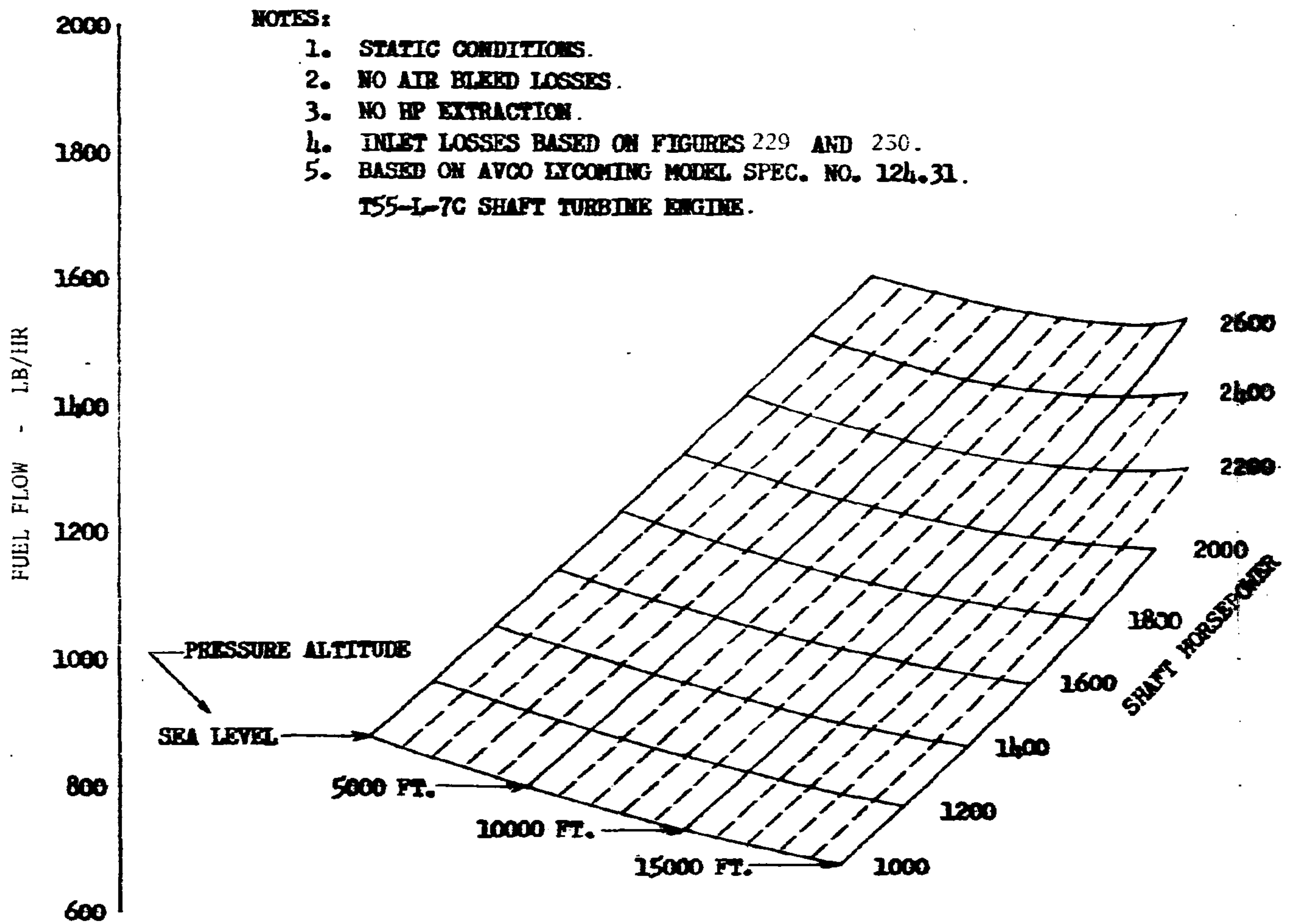
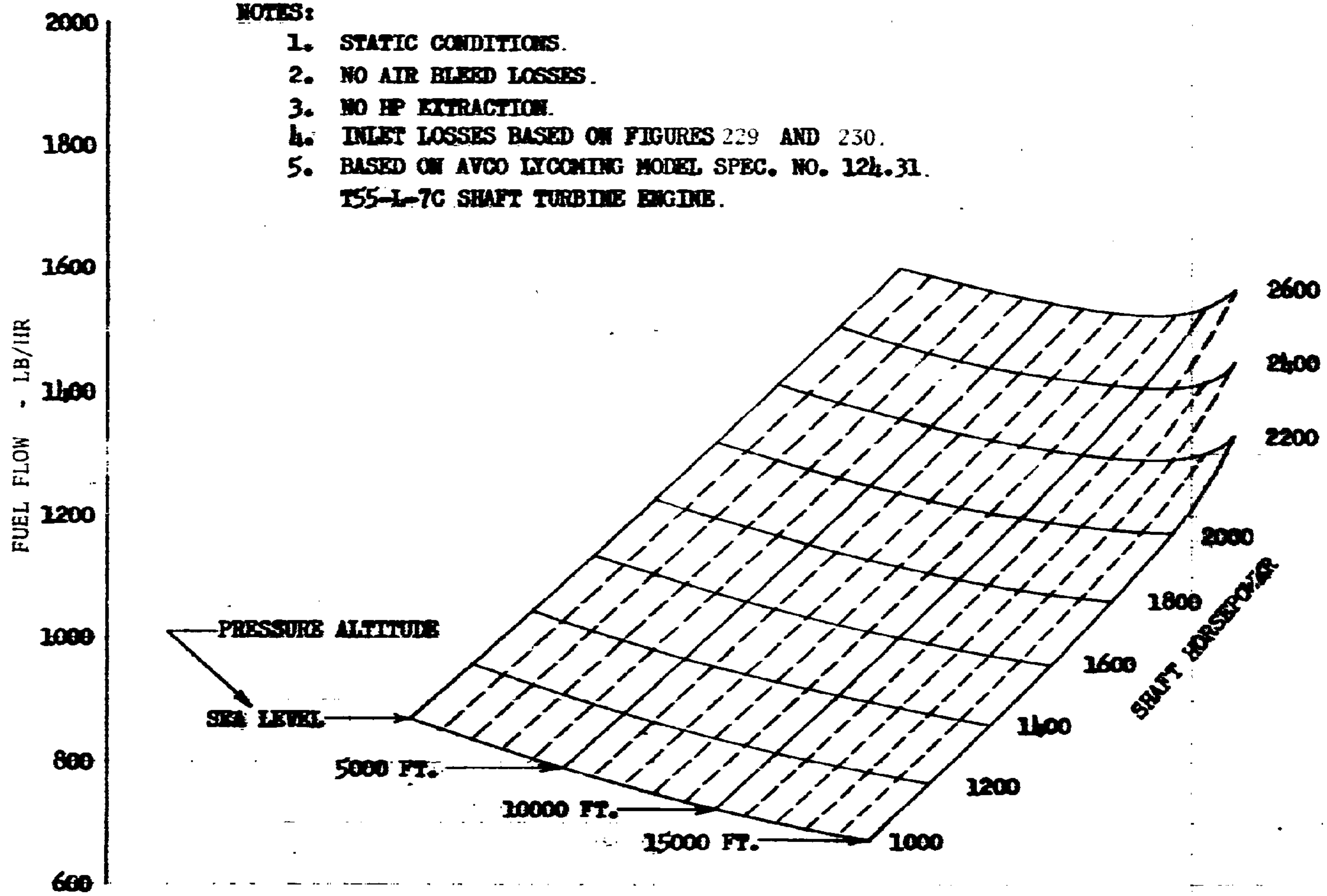


FIGURE NO. 243
FUEL FLOW VERSUS POWER AND ALTITUDE
STANDARD DAY
230 R.P.M.

NOTES:
1. STATIC CONDITIONS.
2. NO AIR BLEED LOSSES.
3. NO HP EXTRACTION.
4. INLET LOSSES BASED ON FIGURES 229 AND 230.
5. BASED ON AVCO LYCOMING MODEL SPEC. NO. 124.31. T55-L-7C SHAFT TURBINE ENGINE.



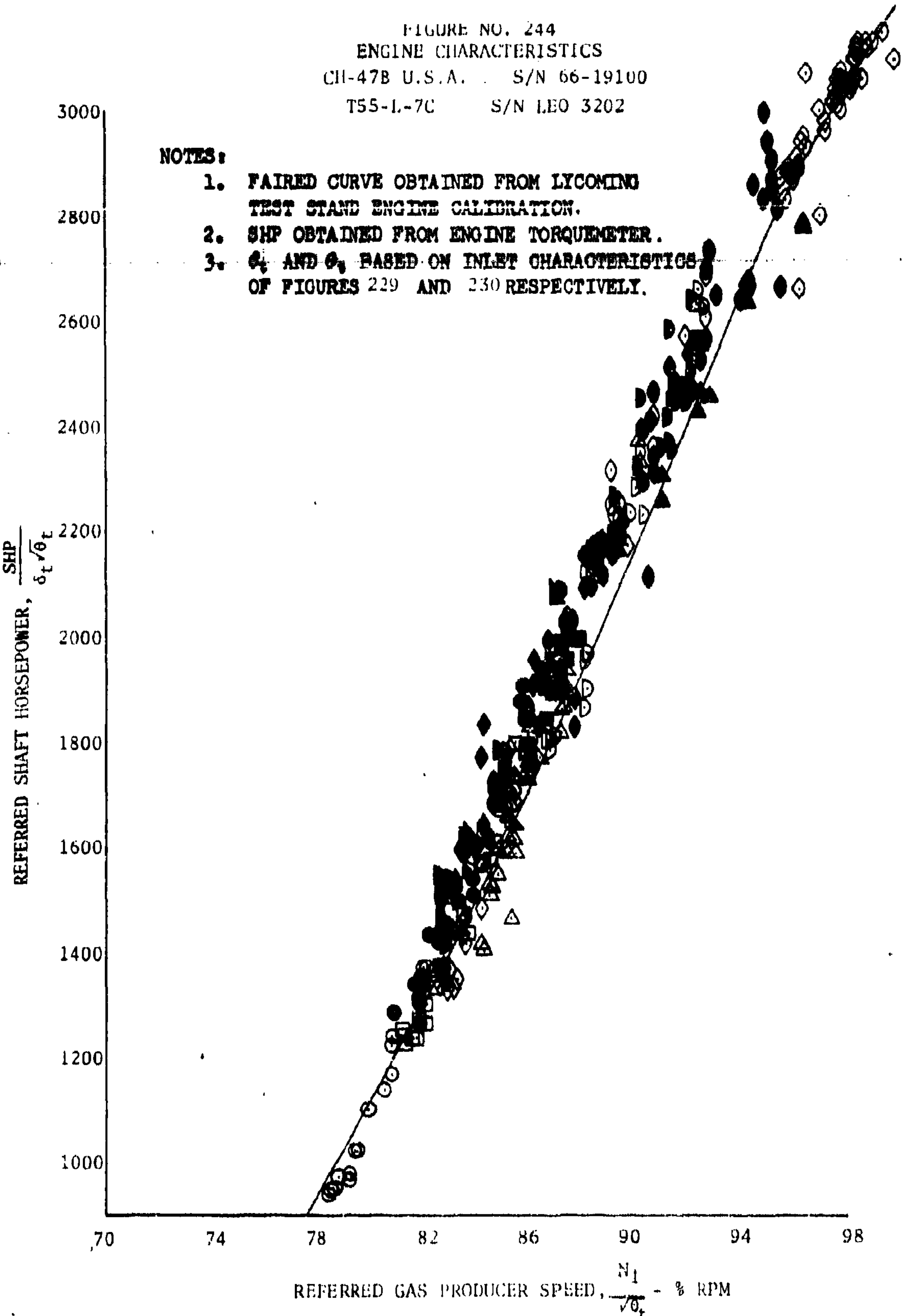


FIGURE NO. 244
ENGINE CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3202
NOTES:
1. FAIRED CURVE OBTAINED FROM LYCOMING TEST STAND ENGINE CALIBRATION.
2. SHP OBTAINED FROM ENGINE TORQUEMETER.
3. δ_t AND θ_t BASED ON INLET CHARACTERISTICS OF FIGURES 229 AND 230 RESPECTIVELY.
REFERRED SHAFT HORSEPOWER, $\frac{SHP}{\delta_t\sqrt{\theta_t}}$
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
70
74
78
82
86
90
94
98
REFERRED GAS PRODUCER SPEED, $\frac{N_1}{\sqrt{\theta_t}}$ - % RPM

FIGURE NO. 245
ENGINE CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3202

NOTES:

1. FAIRED CURVE OBTAINED FROM LYCOMING TEST STAND ENGINE CALIBRATION.
2. θ_t BASED ON INLET CHARACTERISTIC OF FIGURE 229.

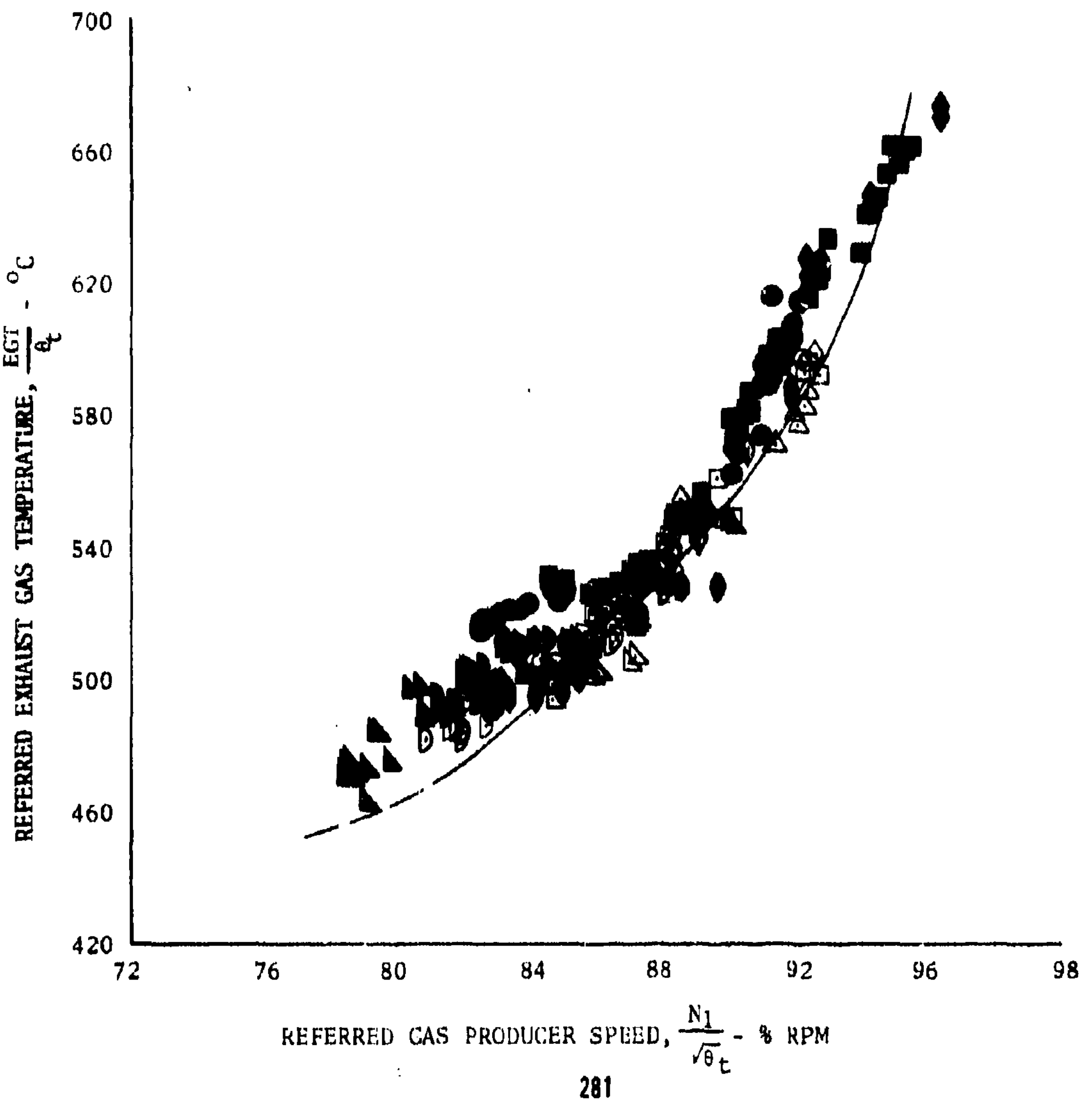


FIGURE NO. 246
ENGINE CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3202

NOTES:

1. FAIRED CURVE OBTAINED FROM LYCOMING TEST STAND ENGINE CALIBRATION.
2. SHP OBTAINED FROM ENGINE TORQUEMETER.
3. δ_t AND θ_t BASED ON INLET CHARACTERISTICS OF FIGURES 229 AND 230 RESPECTIVELY.

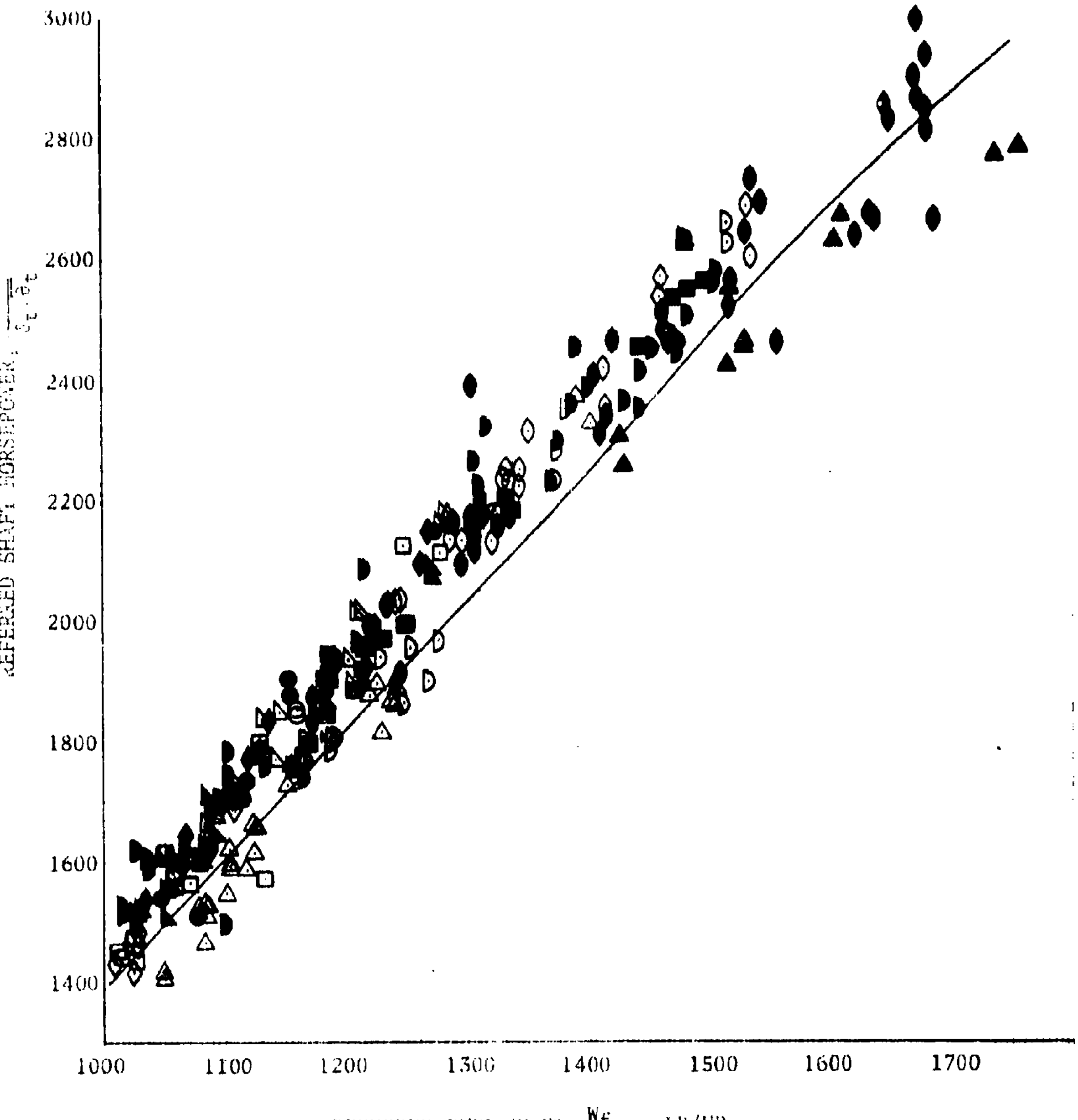


FIGURE NO. 247
ENGINE CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3202

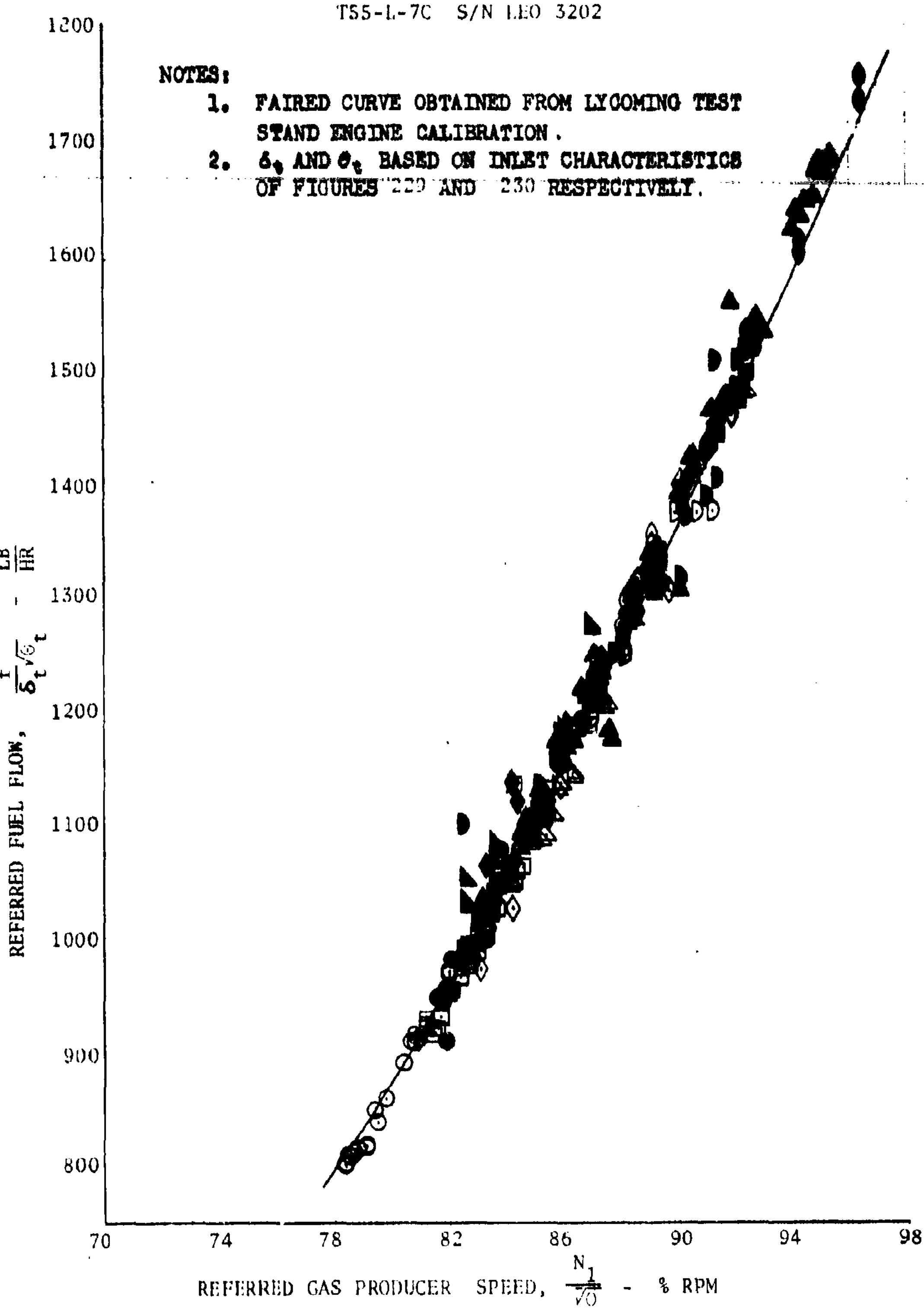


FIGURE NO. 248
ENGINE CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3204

NOTES:

1. **FAIRED CURVE OBTAINED FROM LYCOMING TEST STAND ENGINE CALIBRATION.**
2. **θ_t BASED ON INLET CHARACTERISTIC OF FIGURE** 229.

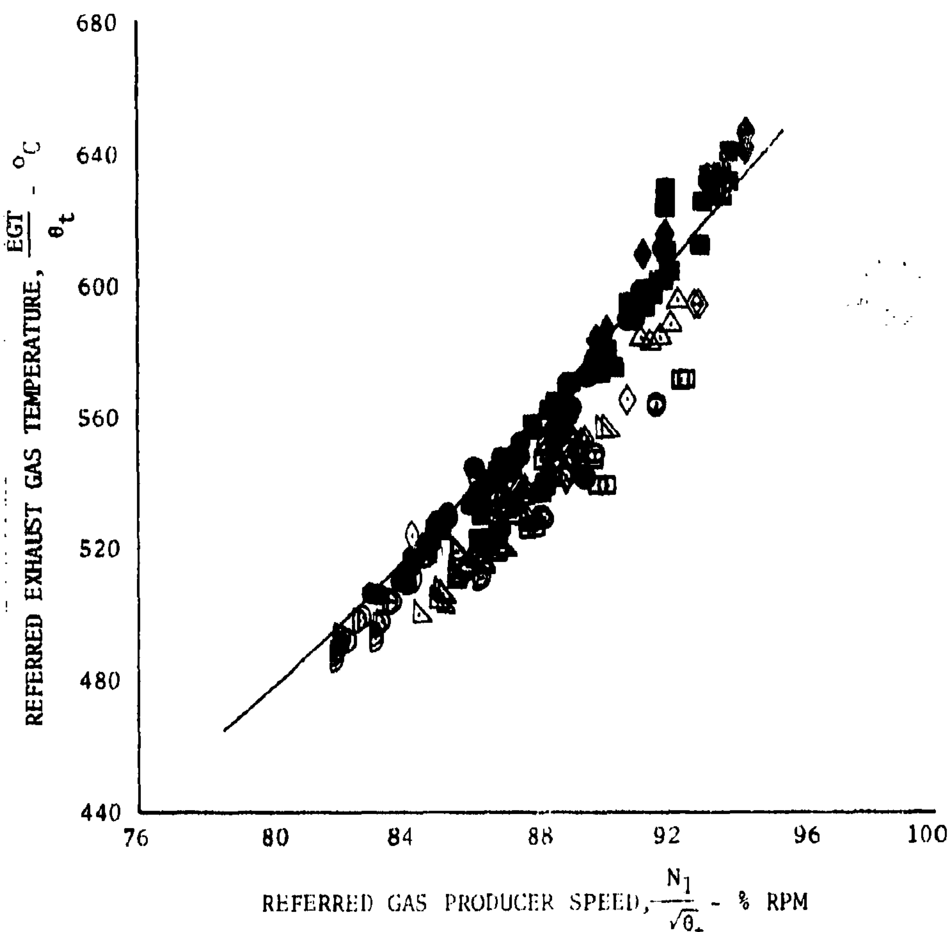


FIGURE NO. 249
ENGINE CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3204

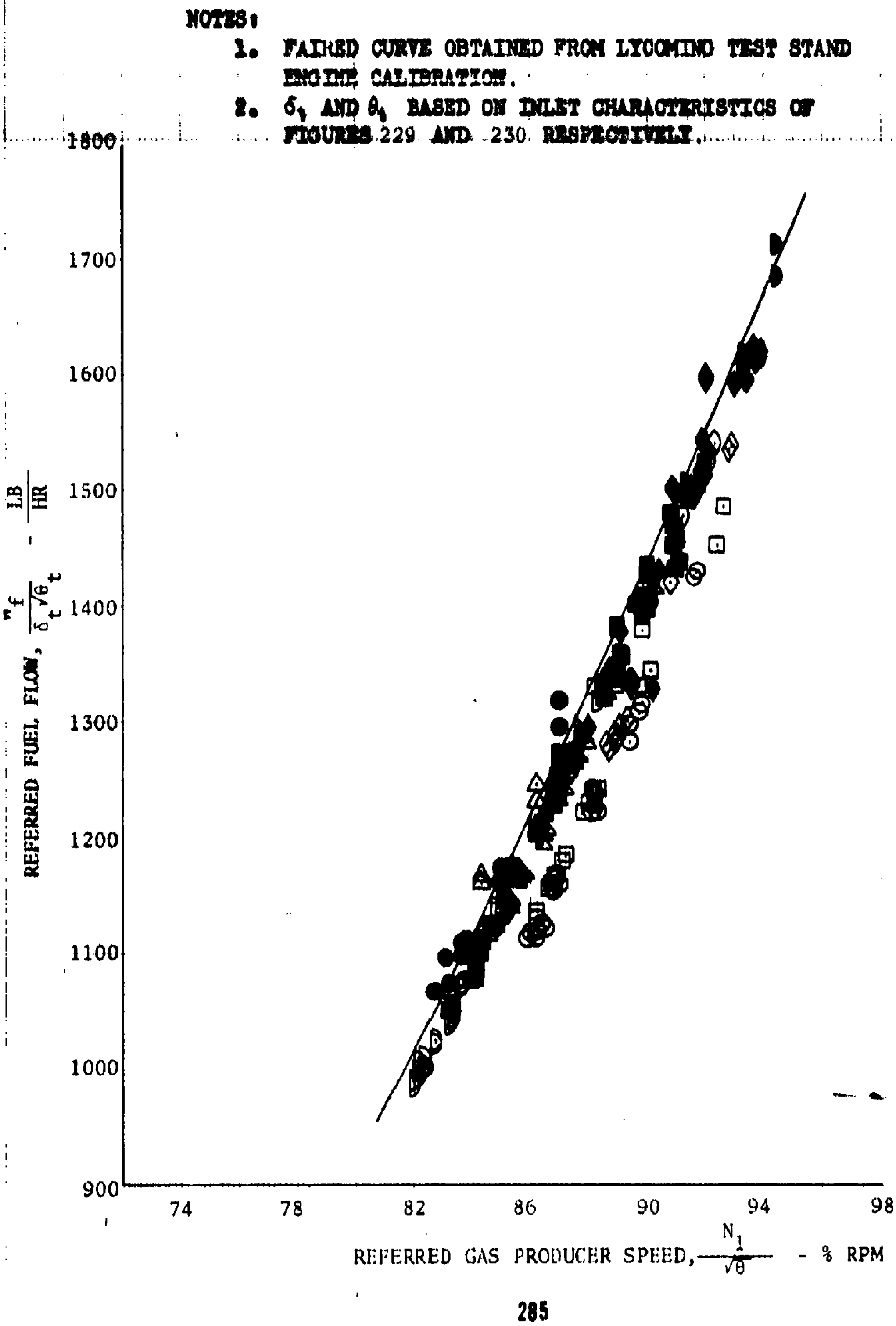


FIGURE NO 250
ENGINE CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 3204

NOTES:

1. FAIRED CURVE OBTAINED FROM LYCOMING TEST STAND ENGINE CALIBRATION.
2. SHP OBTAINED FROM ENGINE TORQUEMETER.
3. δ_t AND θ_t BASED ON INLET CHARACTERISTICS OF FIGURES 229 AND 230 RESPECTIVELY.

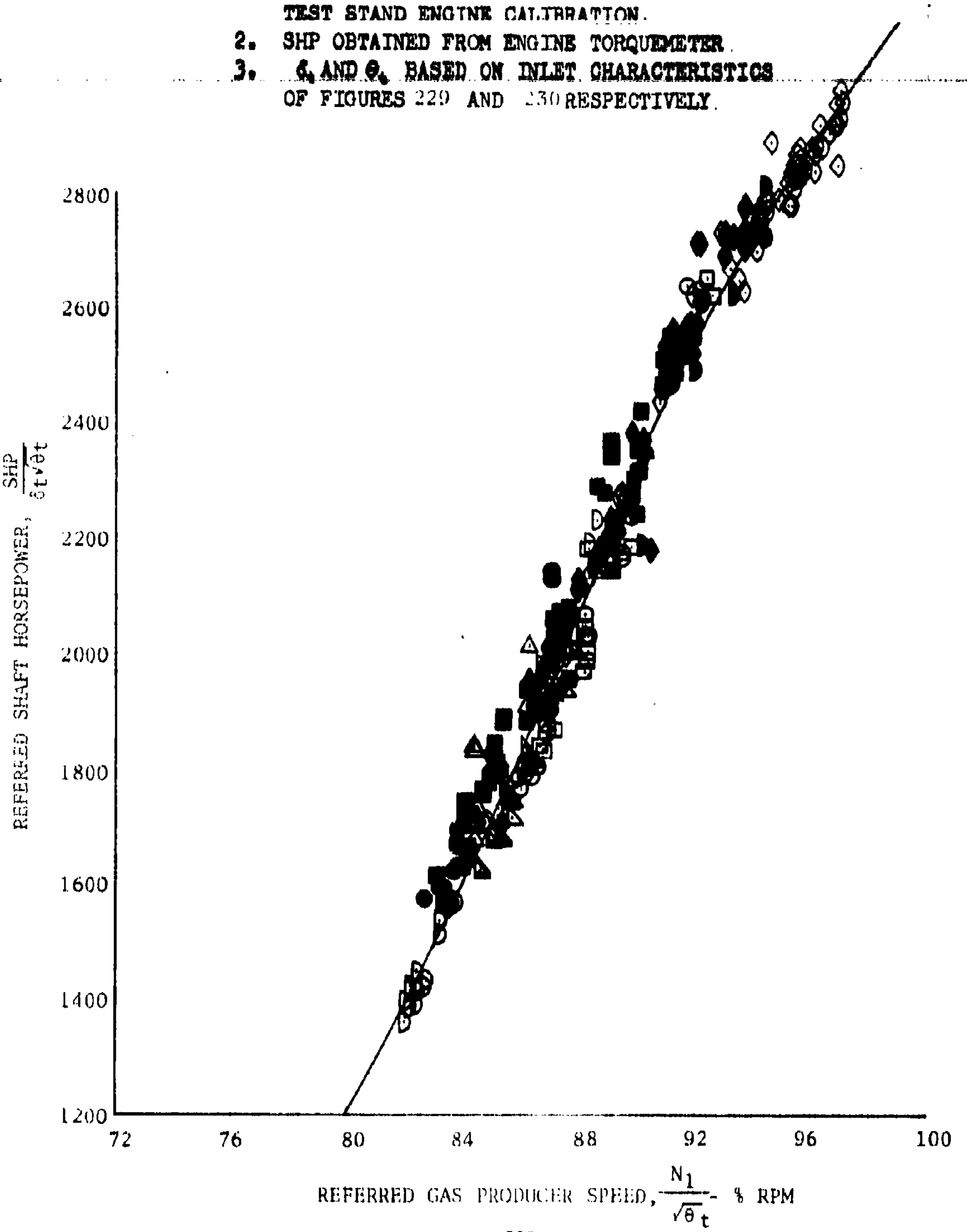
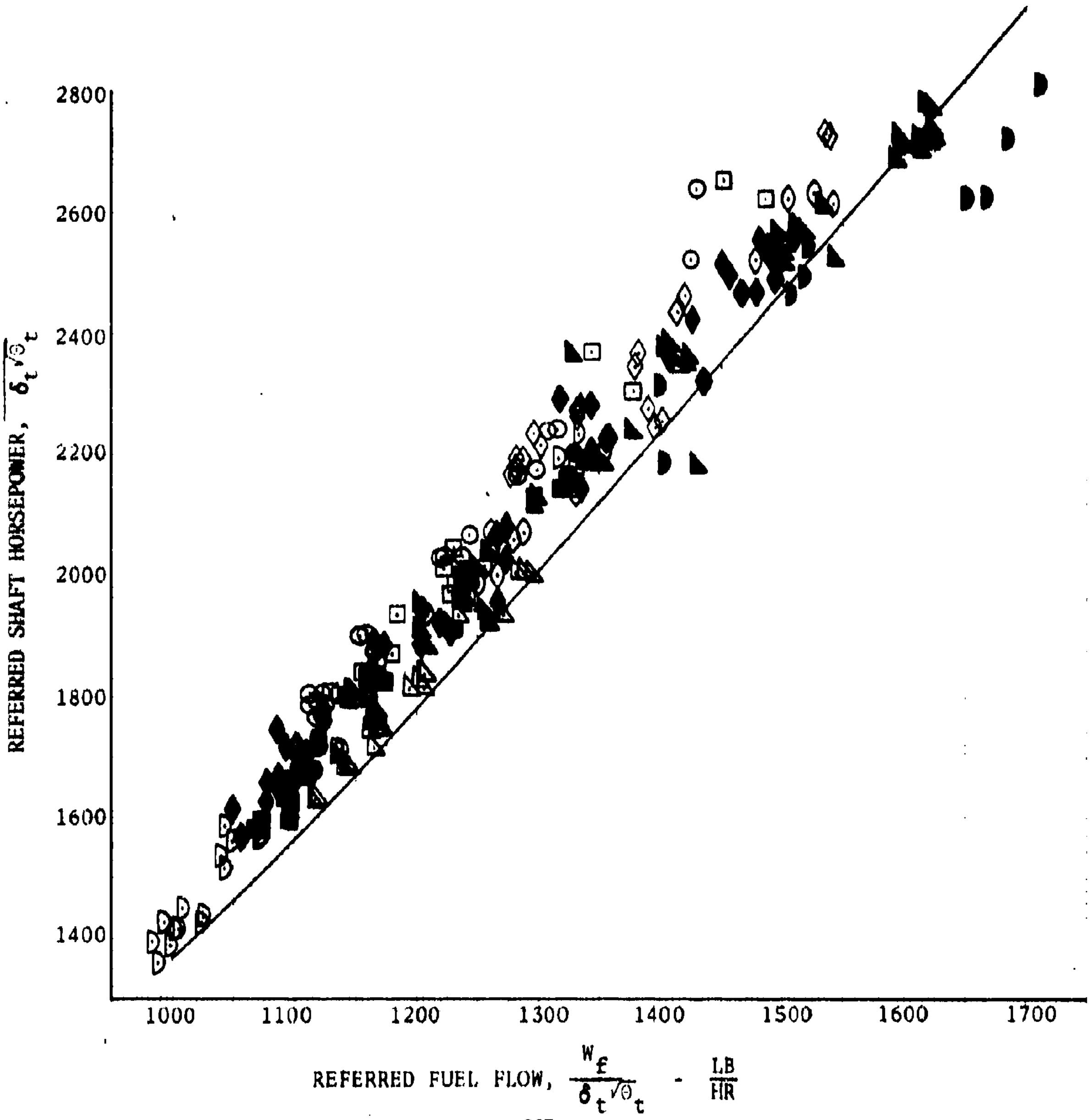


FIGURE NO. 251
ENGINE CHARACTERISTICS
CH-47B U.S.A. S/N 66-19100
T55-L-7C S/N LEO 5204

NOTES:

1. **FAIRED CURVE OBTAINED FROM LYCOMING TEST STAND ENGINE CALIBRATION.**
2. **SHP OBTAINED FROM ENGINE TORQUEMETER.**
3. **δ_t AND Θ_t BASED ON INLET CHARACTERISTICS OF FIGURES 229 AND 230 RESPECTIVELY.**



APPENDIX VI. PAYLOAD CAPABILITY

Radius of action[1], Mission I
6,000 pounds payload outbound
3,000 pounds payload inbound

Radius = 106.3 miles

19,169.0	Empty weight
719.0	Fixed useful load
6,000.0	Payload
4,036.5	Full fuel
29,924.5	Engine start grwt (Mission I grwt)
-98.0	2-minute warmup
29,826.5	Takeoff grwt (outbound)
-1,765.7	Cruise fuel (outbound)
28,060.8	Land
-3,000.0	One-half payload
25,060.8	
-98.0	2-minute warmup
24,962.8	Takeoff grwt (inbound)
-1,671.1	Cruise fuel
23,291.7	
-3,000.0	Payload
20,291.7	
-19,888.0	Empty weight and fixed useful load
403.7	Fuel remaining

$$100 \text{ percent} \times \frac{403.7}{4036.5} = 0.10001 \times 100 \text{ percent} = 10.001 \text{ percent fuel remaining}$$

[1]The above radius of action was calculated using airspeed for 100-percent best range in accordance with the detail specification.

APPENDIX VII. LIMITED PAYLOAD CAPABILITY

Payload guarantee, 100 NM radius, Mission I

Guarantee:	6000 pounds outbound 3000 pounds inbound
Test Results:[1]	7313 pounds outbound 3656 pounds inbound

Item	Limited Payload (lb)	Maximum Payload (lb)
Basic aircraft weight	19,888.0	19,888.0
Weight of full fuel	4,036.5	4,036.5
Payload	7,313.0	12,741.0
2-minute warmup	-98.0	-98.0
Cruise fuel	-1,688.1	-1,901.8
One-half payload	-3,656.0	-6,370.5
2-minute warmup	-98.0	-98.0
Cruise fuel	-1,585.8	-1,633.0
Landing weight	24,111.6	26,662.2
Basic aircraft weight	-19,888.0	-19,888.0
One-half payload	-3,656.0	-6,370.5
Fuel remaining	567.6	403.7
Percent fuel remaining	14.05 percent	10.00 percent

[1]The limiting factor for the weights presented is the capability to hover OGE at 6000 feet on a 95°F day.

APPENDIX VIII. PILOT'S RATING SCALE

CONTROLLABLE CAPABLE OF BEING CONTROLLED OR MANAGED IN CONTEXT OF MISSION, WITH AVAILABLE PILOT ATTENTION	ACCEPTABLE MAY HAVE DEFICIENCIES WHICH WARRANT IMPROVEMENT, BUT ADEQUATE FOR MISSION. PILOT COMPENSATION, IF REQUIRED TO ACHIEVE ACCEPTABLE PERFORMANCE, IS FEASIBLE.	SATISFACTORY MEETS ALL REQUIREMENTS AND EXPECTATIONS, GOOD ENOUGH WITHOUT IMPROVEMENT CLEARLY ADEQUATE FOR MISSION.	EXCELLENT, HIGHLY DESIRABLE	A1
			GOOD, PLEASANT, WELL BEHAVED	A2
			FAIR. SOME MILDLY UNPLEASANT CHARACTERISTICS. GOOD ENOUGH FOR MISSION WITHOUT IMPROVEMENT.	A3
		UNSATISFACTORY RELUCTANTLY ACCEPTABLE. DEFICIENCIES WHICH WARRANT IMPROVEMENT. PERFORMANCE ADEQUATE FOR MISSION WITH FEASIBLE PILOT COMPENSATION.	SOME MINOR BUT ANNOYING DEFICIENCIES. IMPROVEMENT IS REQUESTED. EFFECT ON PERFORMANCE IS EASILY COMPENSATED FOR BY PILOT.	A4
			MODERATELY OBJECTIONABLE DEFICIENCIES. IMPROVEMENT IS NEEDED. REASONABLE PERFORMANCE REQUIRES CONSIDERABLE PILOT COMPENSATION.	A5
			VERY OBJECTIONABLE DEFICIENCIES. MAJOR IMPROVEMENTS ARE NEEDED. REQUIRES BEST AVAILABLE PILOT COMPENSATION TO ACHIEVE ACCEPTABLE PERFORMANCE.	A6
	UNACCEPTABLE DEFICIENCIES WHICH REQUIRE MANDATORY IMPROVEMENT. INADEQUATE PERFORMANCE FOR MISSION EVEN WITH MAXIMUM FEASIBLE PILOT COMPENSATION.		MAJOR DEFICIENCIES WHICH REQUIRE MANDATORY IMPROVEMENT FOR ACCEPTANCE. CONTROLLABLE. PERFORMANCE INADEQUATE FOR MISSION, OR PILOT COMPENSATION REQUIRED FOR MINIMUM ACCEPTABLE PERFORMANCE IN MISSION IS TOO HIGH.	U7
			CONTROLLABLE WITH DIFFICULTY. REQUIRES SUBSTANTIAL PILOT SKILL AND ATTENTION TO RETAIN CONTROL AND CONTINUE MISSION.	U8
			MARGINALLY CONTROLLABLE IN MISSION. REQUIRES MAXIMUM AVAILABLE PILOT SKILL AND ATTENTION TO RETAIN CONTROL.	U9
UNCONTROLLABLE CONTROL WILL BE LOST DURING SOME PORTION OF MISSION.			UNCONTROLLABLE IN MISSION.	10

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13. ABSTRACT

The airworthiness and qualification tests (Phase D) of the CH-47B production helicopter were conducted at Edwards Air Force Base and Bishop, California, during the period 16 October 1967 to 9 July 1968. Performance, flying qualities and mission capability were evaluated to determine the suitability of the CH-47B as a replacement for the CH-47A, determine specification compliance and obtain detailed performance and stability and control information for inclusion in technical manuals and other publications. There were no deficiencies disclosed which would affect the mission accomplishment of the helicopter. There were four shortcomings in evidence for which correction is desirable. The shortcomings observed were the lack of a never exceed airspeed computer in the cockpit, static longitudinal control instability at all airspeeds below 70 knots indicated airspeed (KIAS), unstable dynamic longitudinal control characteristics at all test conditions, excessive cockpit vibrations above 135 KIAS at light gross weights and also at 230 rotor rpm. The increase in gross weight from 33,000 pounds for the CH-47A to 40,000 pounds for the CH-47B and the resulting increase in payload capability are particularly noteworthy. The airspeed capability of the CH-47B is approximately 30 knots greater than the CH-47A; however, the vibration levels at airspeeds above 120 KIAS, light gross weights (below approximately 33,000 pounds) and 230 rotor rpm are excessive.

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14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Airworthiness and qualification tests						
CH-47B production helicopter						
Performance						
Flying qualities						
Mission capabilities						
No deficiencies						
Four shortcomings						
Lack of never-exceed airspeed indicator						
Static longitudinal control						
Unstable dynamic longitudinal control						
Excessive cockpit vibration						
Increased gross weight capability						
Increased payload capability						